AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

▲ ▲ ▲

VOLUME 21. NEW YORK, THURSDAY, OCTOBER 20, 1898. NUMBER 42.

▲ ▲ ▲

The Hydraulic Service Engine of the Pope Tube Company.—I.

The accompanying engravings illustrate a new departure in the construction of pumping engines for high pressure hydraulic service. It is not many years since the horizontal duplex crankless type of machine was considered the only one suitable for this service, and, in fact, sufficiently good reasons could be advanced to convince many that that type of machine was final for the purpose. The supposed harshness of the crank motion was believed by many to forever bar the crank engine from such work. Even at the pressures of water works pumping engines the tendency to slamming of the valves and to violent water hammer on passing the centers, has held speeds down to a very low point, while the problem of quiet running obviously increases with the pressure. Nevertheless in this engine we see a crank machine operating regularly under pressures of 1,200 pounds and over per square inch, and running with complete absence of shock at sixty turns per minute. It has now been in operation for three years, and, though the first of its kind in high pressure service, the repairs on it have been only nominal. A few changes were found necessary at the start, such as the substitution of fibrous for cup leather packings in some places, and a change in the method of governing was found desirable, but of repairs, properly so called, there have been almost none. This result is due primarily to the use of the Riedler valve gear on the pump cylinders, and we believe the engravings which accompany this article to be the first which show that gear from the constructional standpoint. This valve gear has demonstrated beyond cavil that the crank motion is not in fact harsh, and that the difficulties heretofore experienced with crank pumping engines have not been due to the high acceleration of the piston as the crank passes the center, but to the faulty action of spring closed valves. With such valves the turning of the center necessarily finds them open, and since there is no pause in the motion of the piston at the center, the return stroke is commenced with the valves still open, in consequence of which

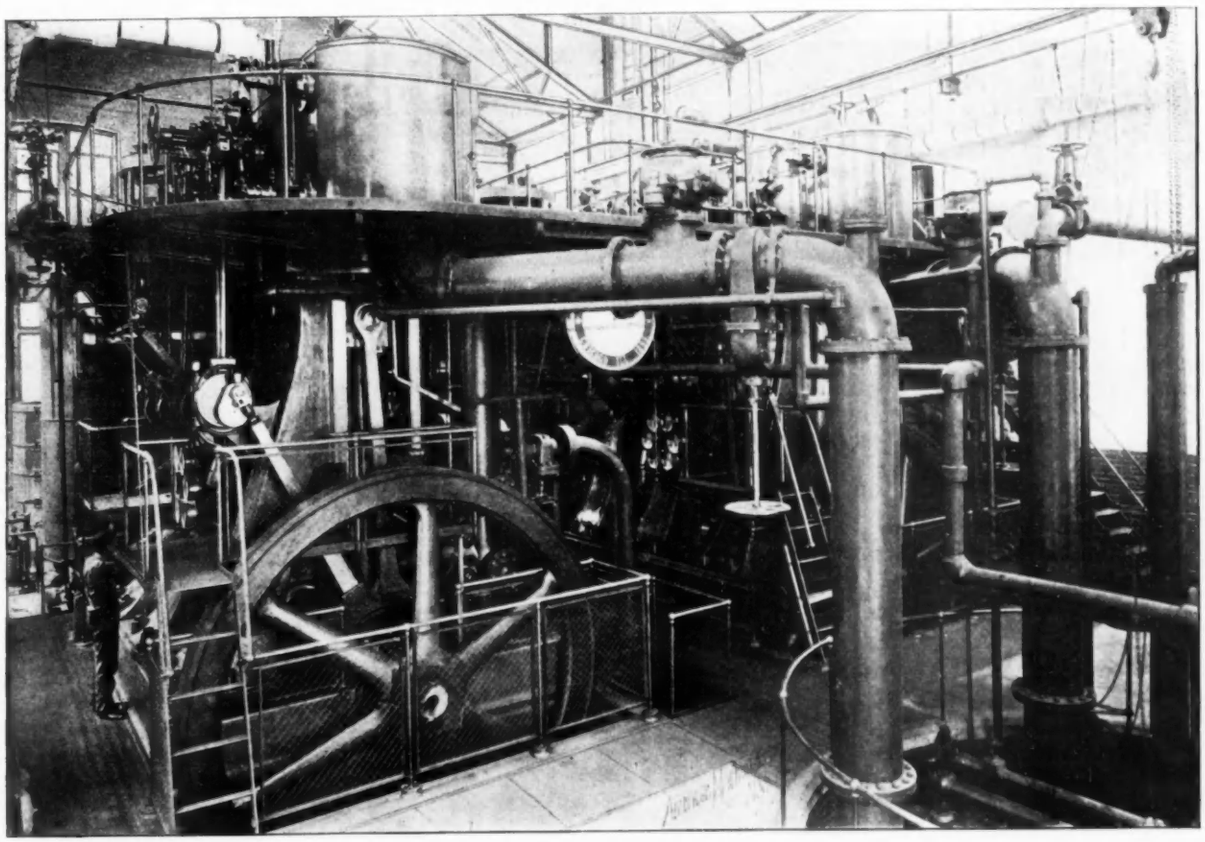


FIG. 1.—GENERAL VIEW OF PUMPING PLANT.

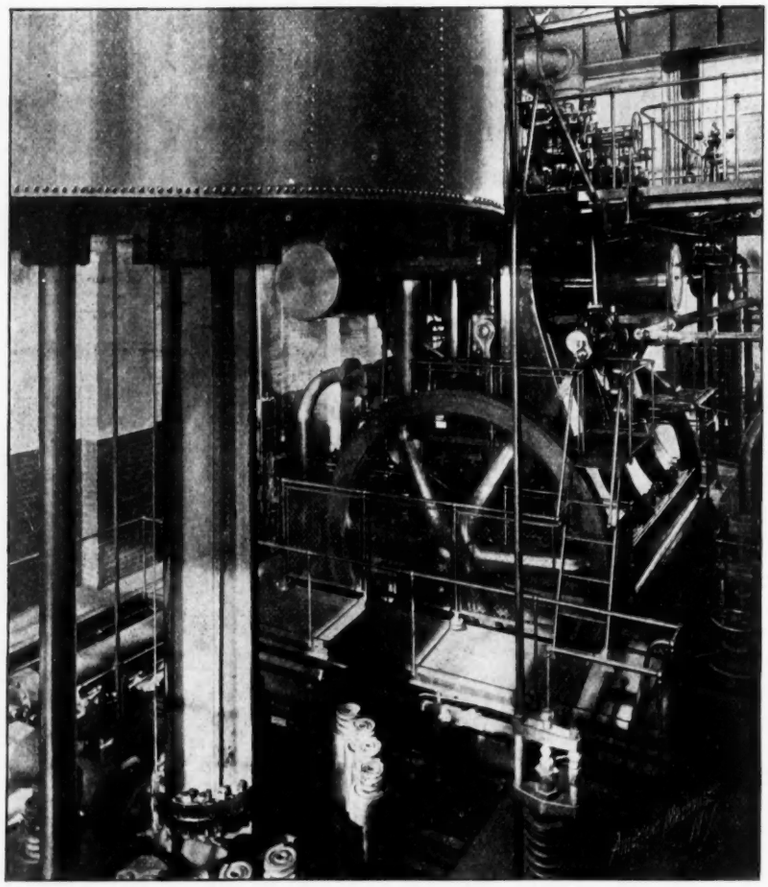


FIG. 2.—ENGINE AND ACCUMULATOR

return currents of water are established. These currents then act to close the valves with great suddenness, the closing of the valves in turn stopping the return currents with equal suddenness, giving rise to the destructive slamming of the valves and water hammer which have baffled designers of high speed crank pumping engines since such engines were first made. In the Riedler system the usual springs behind the valves are dispensed with, the valves being positively closed at the instant the crank passes the center by a moving lever adapted to that purpose. The valves are of the poppet type and are opened by the fluid pressure as with spring closed valves, the only essential difference being in the substitution of positive closing for the uncertain closing due to springs. It will be seen that with gradual closing insured at the instant of passing the center, no return currents, no slamming of the valves and no water hammer, due to the abrupt checking of return currents, are possible, and increase of speed becomes feasible.

The engines at the Pope tube mills are, at the steam end, of the vertical marine type with triple expansion cylinders and Corliss valves, and are designed to secure a high degree of steam economy. There are in fact two complete engines, as seen in Fig. 1, which is from a photograph. The pipes leading to the foreground are the exhaust pipes and lead to the independent condenser, located in the well of which the top is shown. A view of one engine from the opposite side is shown in Fig. 2, in the foreground of which is shown the accumulator, to be more fully shown later on. The arrangement of the steam valves is seen in Fig. 3, from which it will be seen that the high and intermediate pressure cylinders have one wrist plate each, while the low pressure cylinder has two—one behind the other. Figs. 1 and 2 show that the steam eccentrics, are located on an auxiliary shaft carried by the engine frames and driven by two eccentrics on the main shaft—one at each end thereof. One of these eccentric rods with its crank on the auxiliary shaft is seen in both Figs. 1 and 2. The cranks on the auxiliary shaft and the eccentrics on the main shaft have of course, the same throw, and those at one end are at right angles to those at the other—the entire arrangement being strictly analogous in action to the side rods with cranks at right angles on the two sides of locomotives. The auxiliary shaft and the axes of the wrist plates being perpendicular to each other, ball and socket connections are provided between the eccentric rods and wrist plates, while the acting eccentric surfaces are segments of spheres. Fig. 3 also shows the cone belt pulley by which the governor is driven. This pul-

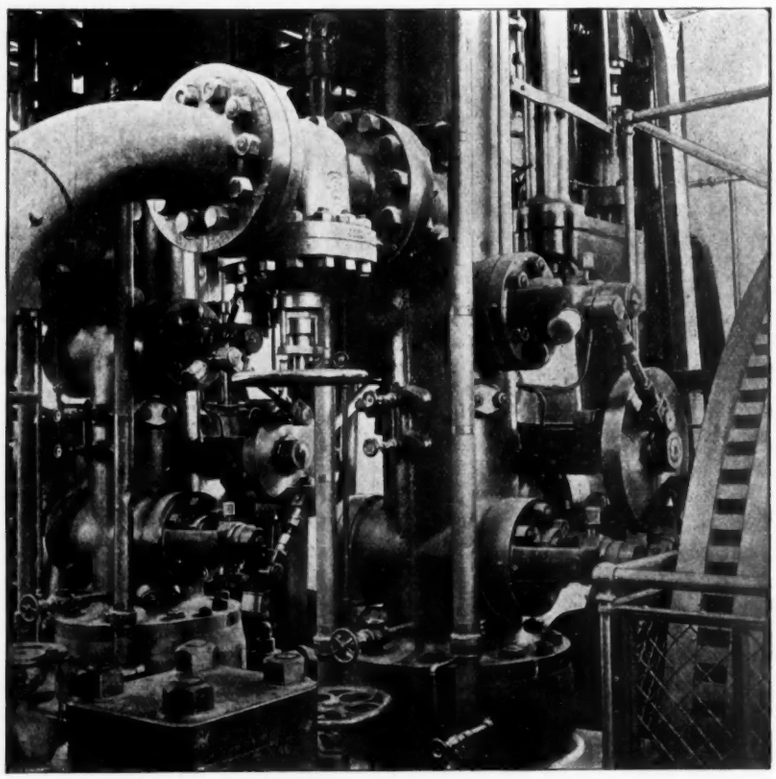


FIG. 6.—WATER VALVE GEAR.

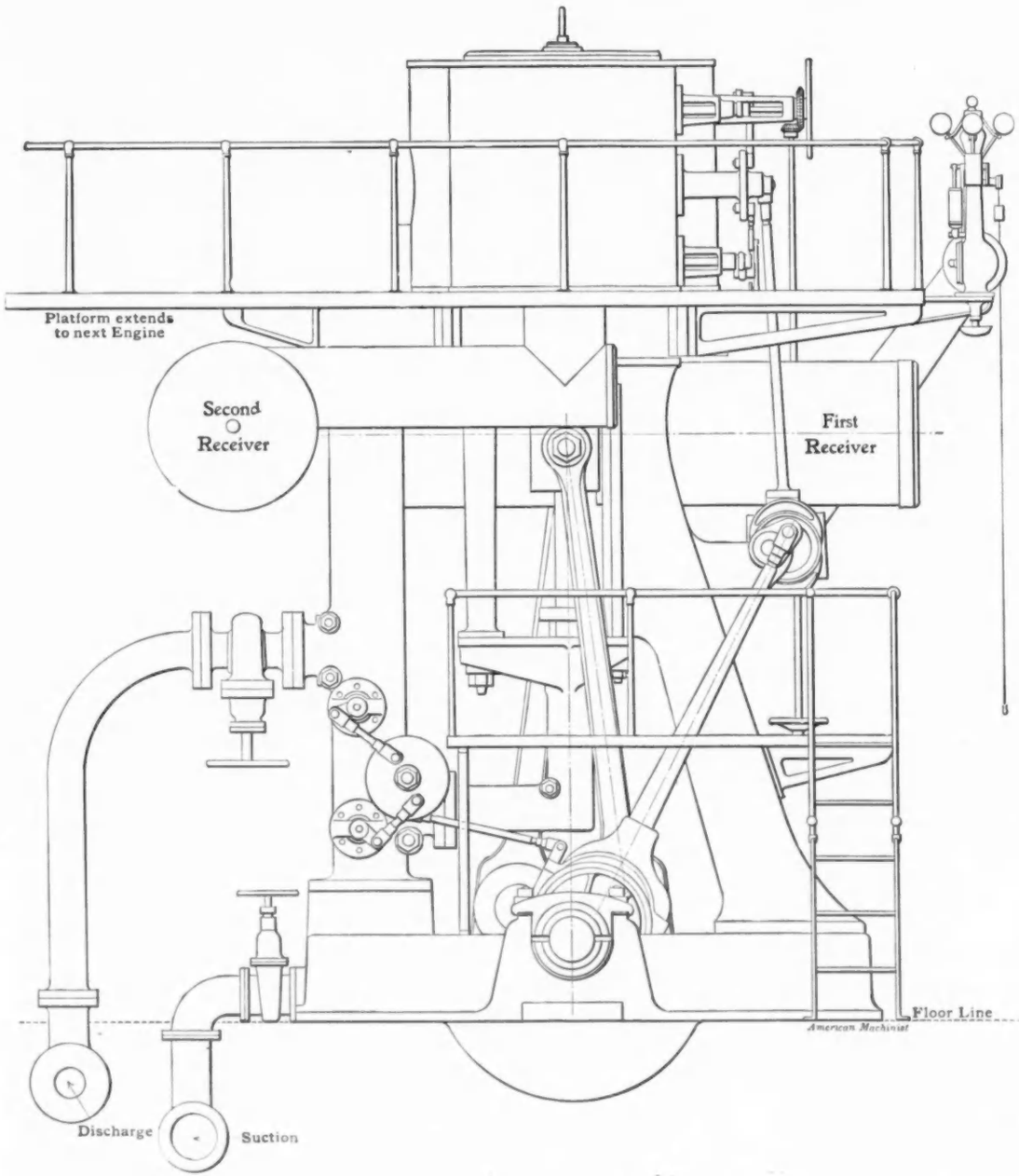


Fig. 4.

SHOWING ARRARGEMENT OF PUMP CYLINDERS AND VALVES.

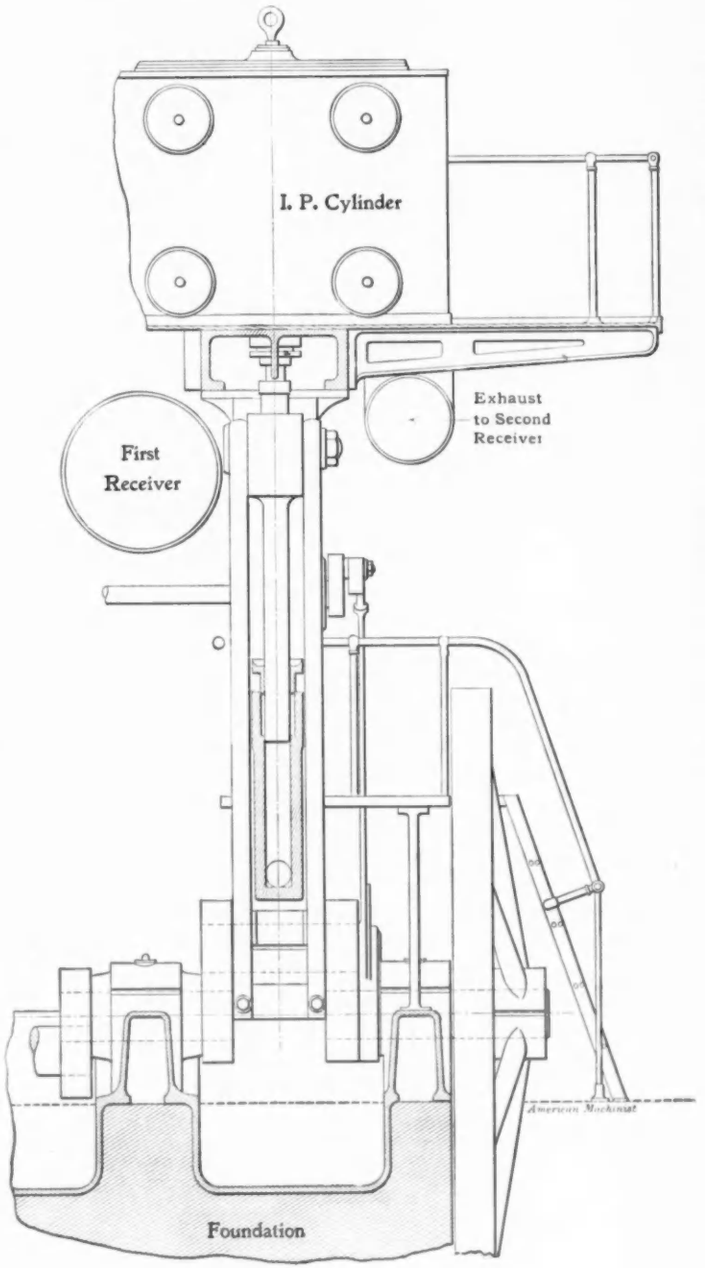


Fig. 5.

SHOWING DOUBLE CONNECTING ROD.

ley is belted from a similar but reversed cone on the auxiliary shaft below, as may be seen in Fig. 1. The entire arrangement will be referred to again and more at length.

The pump cylinders are too much hidden from view in Figs. 1 and 2 to be readily seen, but Figs. 4 and 5 show them very clearly. Fig. 4 shows how the pump cylinders are supported by one of the frame stanchions and by a special hanger, while Fig. 5 shows the double connecting rod construction by which the pump cylinder is brought exactly in line with the steam cylinder piston rod. Fig. 4 also shows again the auxiliary shaft and the method of driving it as well as the outer valve gear of the water end. This will be seen to comprise a gear containing a Corliss wrist plate, rock arms actuating shafts, on which suitable arms inside the water space act to close the valves. The lower valve is, of course, the suction, while the upper is the discharge valve, and the connections to the mains are apparent. The cylinders shown in Fig. 4 are, of course, the outer cylinders, and the eccentric for the auxiliary shaft is so set as to also act for the water valve gear, but for the other cylinders special eccentrics are necessary. Fig. 6 is a half-tone showing the valve gears of two of the water cylinders.

The steam cylinders are 19, 32 and 49 inches in diameter by 30 inches stroke, the diameter of the water plungers being 5¾ inches. The engines were designed for 135 pounds steam pressure and 1,200 pounds water pressure, although the latter has been increased to 1,450 pounds.

▲ ▲ ▲

Workingmen's Houses in Germany.

Vice-Consul J. F. Monaghan writes from Chemnitz, August 15, 1898:

"There is a movement on foot to furnish workingmen with better tenements. Now they are crowded into buildings which often look like barracks. The proposed houses will be built upon lots about 16½ feet wide by 102 feet deep, thereby allowing for a front yard for flowers and a back yard for a vegetable garden and shed, the latter for the keeping of poultry or some domestic animal. The houses will contain five rooms. A parlor and kitchen will be on the first floor, the parlor containing a porcelain stove and heating pipes, and the kitchen a wash boiler and stove. The three bedrooms on the second floor will easily hold five or six persons, and can be made to accommodate ten. In the largest an iron stove will be placed. A pump will provide water where the city water works do not extend to the house. In connection with the shed is a water closet. The cost of such a house and lot, when a number are built at a time, will be between $850 and $950. It will rent for about $53 a year—that is, for the same price the workingman has to pay for two rooms in the barrack-like tenements of the large cities."

▲ ▲ ▲

Technical Publications.

PROSPECTUS AND ANNUAL REPORT FOR 1898 OF THE EDUCATIONAL DEPARTMENT OF THE YOUNG MEN'S CHRISTIAN ASSOCIATION.

The first of these pamphlets gives in outline the standard courses of study of the evening classes conducted by the Y. M. C. A.—the standardization of the courses having been found necessary on account of the growth of the association's educational work. The standardization extends no further than the framework, however, individual teachers being expected to fill in the details of the work.

The subjects covered comprise mathematics, bookkeeping, law, government, politics, drawing, practical science and manual training, and from the annual report we learn that last year 25,130 students attended the various classes, the largest number from any one walk of life being 4,065, who were mechanics.

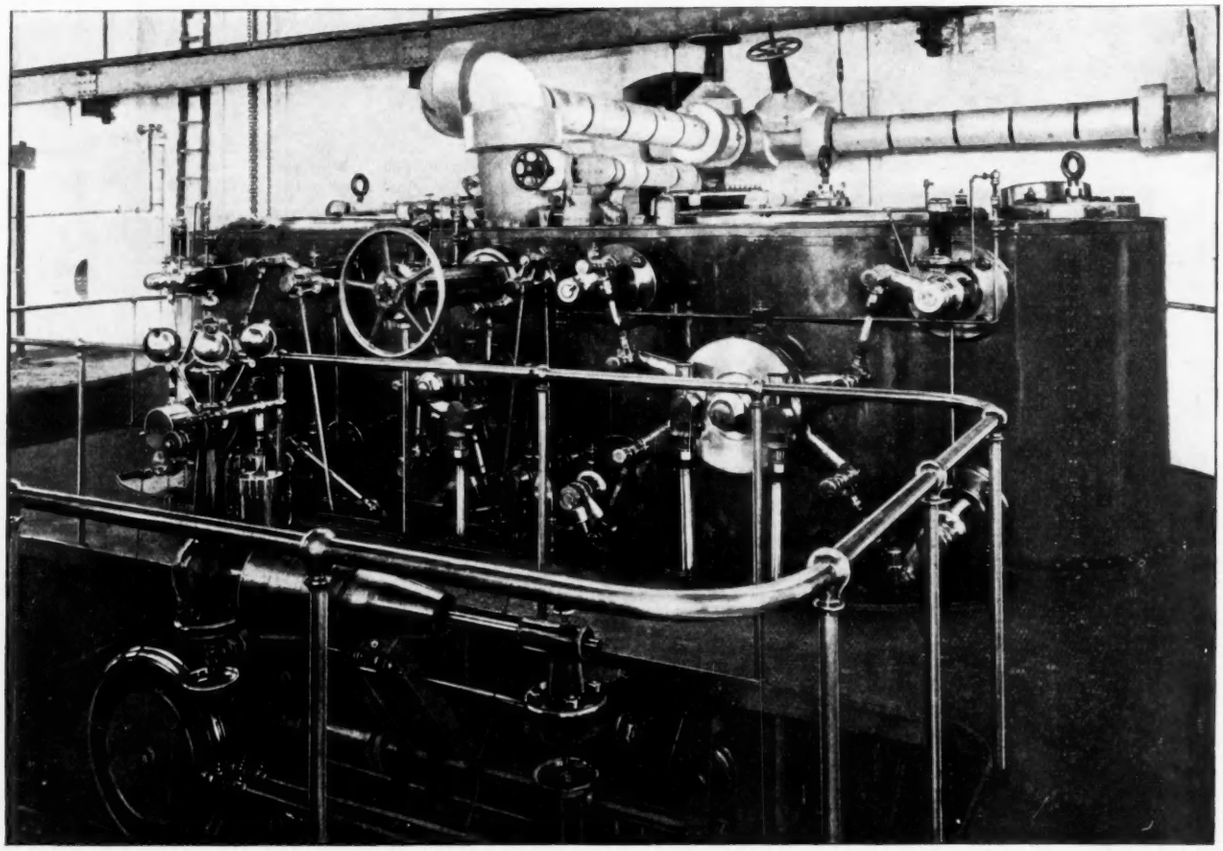


FIG. 3.—STEAM VALVE GEAR.

John Teck and the Oil Wells.

BY JOHN RANDOL.

John Teck comes of a highly respectable as well as highly successful family well known in Western Pennsylvania and in Philadelphia. John has a taste for mechanics, honestly his, as all the Tecks have been more or less connected with manufacturing enterprises, although the first Teck was an immigrant farmer, and all of the Tecks without exception manufacturers, contractors, bankers or what not, own farms, though they do not rate these farms as productive assets. Having mechanical tastes, and having a very hard round head, John early formed the conclusion that he would adopt the profession of mechanics, because mechanics was the foremost thing of the world, and he told his father that he would like to take the M. E. course, and the time of John Teck's visit to the oil wells was immediately after he completed his studies at Idealburg, where he formed a great friendship for Professor Triangulus, who had started in life with the intention of being a mechanic, but failing to find a berth exactly fitting his individual corners—which were of the acute and non-adaptive order—became a college professor instead. In the college Professor Triangulus was supposed to be a distinctively practical man, because he had struggled into and out of some posts of importance in real machine shops before he finally laid up for life in the professorship at Idealburg; to do Professor Triangulus justice, practical mechanics was really his early ideal, and it is his misfortune rather than his fault that he was not built in a way to realize his dream.

At graduation John Teck read a paper on "Power Transmission Elements," which was thought to be a very promising effort, and was considered very fine by the various members of the Teck family gathered at Idealburg on that occasion, and was, to tell the entire truth, regarded as little short of miraculous by a girl cousin of John's belonging to the Western branch of the Teck family, whom John had not met for several years previous to commencement.

Upon the conclusion of the Idealburg function John accepted with great alacrity an invitation of the Uncle Teck who was the father of the girl cousin to accompany him to his home in Warren for a rest and recuperation of indefinite duration, after the mental exertions of his studies.

The other side of Harrisburg, on the train, Uncle Teck told John about some oil wells he had on a farm in the outskirts of Warren, which had once been good paying property, but were now "pumpers" and "bailers," with machinery in advanced stages of decrepitude, and suggested that John should take a look at the outfit and see what he thought about the renewals needful.

None of the Teck family has ever been above a joke, or lacking a serious countenance in carrying out a delusion, and it is possible also that Uncle Teck, who, while making no claims to engineering capability, and perhaps really unaware of the possession of such talent, had, nevertheless, carried to success more than one faltering enterprise by the exhibition of infallible prevision of ways and means for doing things which others had failed to do—it is possible, I say, that Uncle Teck had some kind of an idea that the sooner John Teck met actual conditions of a grade seldom recognized by technical educators the better it would be for his nephew. But whatever Uncle Teck's motive may have been he beguiled many a mile of the up-hill climbs from Harrisburg toward Erie with talk to John about the oil wells, which he described as being mainly pumped from a central power station, though two or three were treated in individual isolation.

John Teck's ideas of oil wells were very hazy. He knew the general appearance of a valley among the hills, full of weather beaten derricks rising among the sombre foliage of the trees, and that was about all. He was much interested in what his uncle said to him, and asked some questions in regard to natural gas, because he had his own opinion of gas engines, but he said very little because he felt that he would know more when he saw the wells next day, and besides all that it isn't the way of the Teck family to talk very much unless they have something to say and are pretty sure of what it is.

The next day, after John had breakfast, and had sufficiently admired the beauties of Warren, he gathered up his camera and told Uncle Teck he would walk over to the oil wells. Uncle Teck offered a carriage and driver, but John preferred to walk, and was directed to go up the hill to the high road on the crest, and then travel eastward until he came to the derricks. "There you will find Mr. Uhl; the wells are on the Uhl farm," said Uncle Teck. "He was born on the farm and has known the wells since they

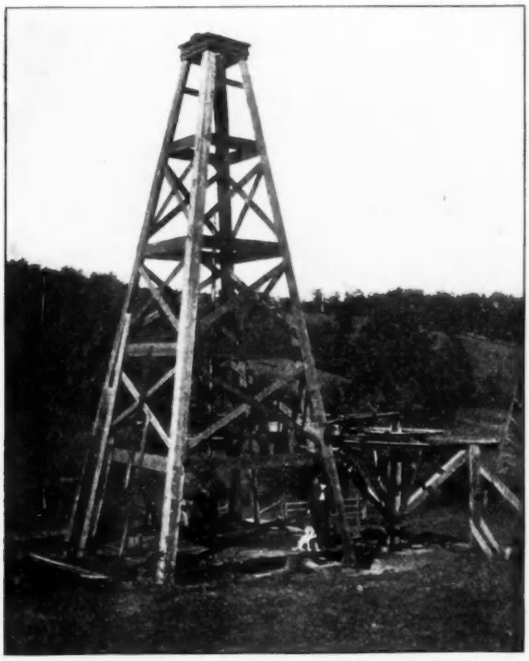


FIG. 1.—A "BAILER" DERRICK.

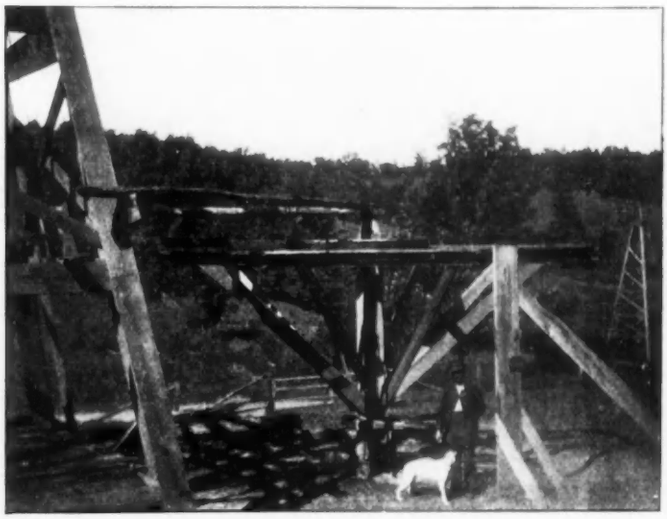


FIG. 2.—ENLARGED VIEW OF HORSE-POWER FOR RAISING "BAILER.

were drilled, and has entire charge of them, and can tell you all about them—sorry I cannot go over with you, but I have other matters for to-day."

John found the Uhl farm of ninety-seven acres in Conawango township, and he found Mr. Uhl, who told him a great many things he did not know before, and he made several exposures with his camera.

The next day he printed some pictures early, and wrote the following letter:

Professor Triangulus:

DEAR PROFESSOR—I have done my first work as consulting engineer, by examining some oil wells at my uncle's request, and if every piece of work I perform gives me as many new ideas as this one gave me I shall have enough to think about. The one great thought which overshadows all others in my mind to-day is that there is a side of engineering which I never heard of before, and it is borne in upon me that this new side is the most important side of engineering there really is. I hardly know how to specify my exact thought, but it relates to negations—no tools, no money, no art, no aids of any sort outside of a man's own head and hands, and yet from these negative factors the positive result of a valuable and durable operative mechanism, exactly adapted to its purpose, is produced.

All of this, as you can well understand, makes me doubt not only myself but all I have studied and endeavored to learn up to this time, and leads me to ask myself what my real education is going to cost me (or someone else) in dollars and cents before I reach a plane of sound, commercially valuable engineering knowledge.

But let me be textual in regard to these miserable three-quarter barrel oil wells on the Uhl farm.

First of all, it was a joke which Uncle Teck saddled on me coming up on the train. He said he had a group of oil wells, once valuable, but now fallen to low production, and that the machinery for operating them was worn out and must be replaced, and he would be glad to have me look at them and see what I thought it best to do.

I will not tell you what I thought to myself, because you know very well what my ideas as to power transmission are, and you know how assiduously I have applied myself to study of the mechanical elements embodied in the problem, and you know that I have flattered myself with the belief that I really knew something of the best methods of transmitting power in any case that might be proposed. Fortunately I did not say anything to Uncle Teck, so he doesn't know how far off I was, but I really think he guessed pretty close to the truth. I hope I may live long enough to get even with him.

To begin with, there are eight of these three-quarter barrel wells, five "pumpers" and three "bailers," and they altogether produce somewhere about 35 or 40 barrels of oil a week, worth $1 a barrel. The wells are about a thousand feet deep and cost about a thousand dollars each for drilling. Some of them paid a "bonus" of $200 each from the future well owner to the land owner, in addition to the one-eighth royalty. These wells are fifteen or sixteen years old.

Mr. Uhl owns the farm of ninety-seven acres on which the wells are located, and he has 20 cents a barrel for bailing the three bailers, and the five pumpers, all pumped from one steam engine fired with natural gas, are attended by Uhl at a monthly rate. Uhl furnishes the horses for operating the bailing hoist. The pumpers are pumped with lifting pumps operated by bell cranks. The engine is somewhere nearby in the middle of the group of five pumpers, and is belted with a quarter turn belt to an upright wooden shaft carrying a horizontal crank at its upper end; on the wrist pin of this crank a wooden disk is fitted, about 20 inches diameter, and this disk has jaws and pins to take five hooks, and from the hooks half-inch iron rods, screw-sleeve coupled, are led to each well pump bell crank, taking hold of the lower end of the vertical member, the pump rod being dropped into the well from near the end of the upper bell crank member. Some of the wells are perhaps 500 or 600 feet from the engine.

The gas is lighted under the engine boiler in the morning, and that is all there is to it. The engine is without a governor, the steam is throttled to give the proper rate of speed for the pump rods, and as the fire and the work are constant the boiler feed can be exactly gaged with the pump supply cock, and if the engine is oiled once a day that is all there is to be done. All of the oil pumps are piped to a common receiving tank, and this tank is piped to the pipe line and is emptied by the pipe line gager, who gages the tank, empties it and gives a certificate of delivery, which the pipe line company pays on presentation.

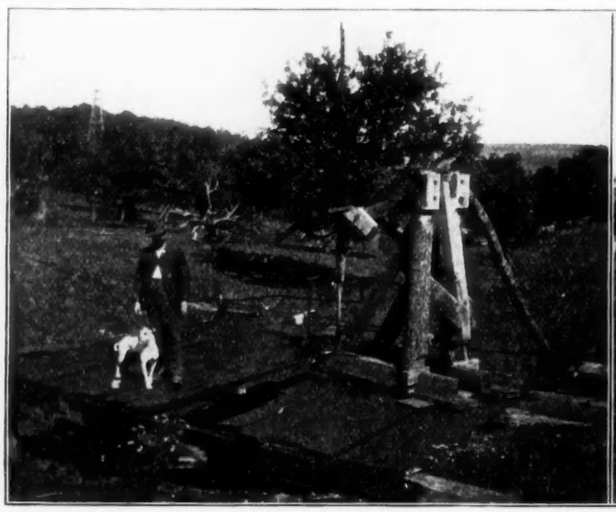


FIG. 3.—BELL-CRANK FOR OPERATING PUMP ROD OF PUMPING WELL.

FIG. 4.—SUPPORT FOR BELL CRANK ROD.

The Uhl farm is arable, and Farmer Uhl raises corn, wheat, oats, hay and buckwheat, and has four cows, three work horses and a brood mare and colt. His taxes are $70 a year, and he lives in a vine covered cottage and has an orchard and vineyard, drinks from a living spring of soft water, and is a free man, master of himself and all he surveys.

Uncle Teck told me that much of the "machinery" must soon be renewed. This renewal has taken place very recently at one of the "bailers," shown in Fig. 1, which also contains a portrait of Bailer Uhl and his white bulldog Danger. The tower, or "derrick," is made of rough hemlock stuff, the uprights 2 inches thick and the braces 1 inch thick, all nailed together. The horse-power is made of

hemlock lumber likewise, nailed to an upright shaft which has a cast iron wing-gudgeon fitted into its lower end. You can see this more plainly in Fig. 2, which is a larger view of the horse-power and rope winding drum. The rope is ¾-inch manila and costs $12 for the 1,000 feet required. For labor and material the horse-power and derrick cost for the structures about $28, and the "bailer," a tin bucket, about 8 inches diameter by 25 feet long, with a valve at the bottom, cost about $18. This makes about $58 total cost of the machinery of one bailing well. And this $58 outfit is what my worthy uncle proposed I should "look at" and see what "could be done!" I could, evidently.

What would this derrick, 40 feet high, and this horse-power and winding drum have cost if I had designed them and had them built according to the best of my knowledge?

It makes my cheeks burn to think of it! Observe the correct proportions of the tower and the proper distribution of material throughout; notice the tangent bracing of the winding drum—in short, please understand that the whole of this $28 job is the work of a *real* engineer, a man who can make the best things for the least money! I saw the man who built this job, and I doubt not hundreds of others just like it, and his boy, about sixteen years old, who helps him, but I did not tell him what kind of an engineer I thought he was. If I had he would probably have told me he was a carpenter, not an engineer. I did not tell him I had just graduated at Idealburg. If I had I suppose he would have thought I must know a lot, which is not my own present opinion.

On the upper part of the vertical horse-power shaft there is fixed a wooden brake drum, with a brake band of band iron, say, 2½ or 3 inches wide, by which the velocity of the 1,000-foot drop of the "bailer" down the well is regulated. When the bailer is at the bottom the horse is hitched to the horse-power lever and the bailer is wound up to the surface; the bailer can be lowered and raised again in ten minutes, and it holds about one-third of a barrel.

The machinery of the pumpers is shown in Figs. 3 and 4. The bell crank is pivoted at the top, on a double-ended gudgeon, running in wooden boxes. The pump rod is carried up high above the upper bell crank member and forms a flagstaff, the motion of the flag showing from a long way off if the pump is at work. The frame for supporting the bell crank is of substantial timbers, some of which still retain their bark, only the ends being slabbed off for fitting; but the form and bracing are all right.

How do you suppose the ⅛-inch actuating rod, say, 600 feet long, somewhere nearly horizontal, is supported to slide? You remember the extended consideration I gave to this problem? I was glad when Uncle Teck was talking on the train about the oil wells that I had all the details of rod transmission in my head. But on the Uhl farm they don't use any of the ways I had thought about. They just cut two saplings and drive them into the ground, and nail a board across the top, see Fig. 4, and tie a piece of three-quarter manila rope to the crossbar, and then tie the other end to the bell crank driving rod, and that's all. No joints, no slide, no friction, no oil, no repairs. And from the weathered look of the ropes I should say they last a very long time.

I think this rod support made me feel smaller than anything I ever saw before. I was sure of that detail, you know?

Uncle Teck went to Buffalo yesterday and has not yet returned. I may not meet him very soon. I have pretty well concluded that the best thing I can do is to travel for a year—where doesn't make much difference—I can be taught almost anywhere, I fancy—and try to average up my actual standing before I attempt to do anything else.

Faithfully yours,

JOHN TECK.

▲ ▲ ▲

An Odd Gear Pattern.

BY JOHN M. RICHARDSON.

Several years ago I made a pattern for a gear, to be used on a special machine for wrapping paper about oranges, and as I never saw one like it before, and have never seen or heard of one of the kind since, I thought a few words describing it might be interesting to some.

I cannot at this time give the exact dimensions, but should say that this gear was about 5 inches in diameter, had, perhaps, 48 teeth and was shaped like Fig. 1.

The gear was eccentric, the shaft being placed at about one-third of the diameter instead of at the center, while the edge containing the teeth was a true circle, and it was designed to give a variable speed to the twister mechanism, after the orange had become enveloped by the paper, but why some form of cam motion was not substituted in its stead is more than I can tell.

The peculiar thing about this gear was that it took a common spur pinion with straight teeth, while the teeth on one-half of the gear were all different, each one having a varying shape. The whole affair was symmetrical on the line *x*-*y*, Fig. 1, but the teeth at *x* were of ordinary shape, growing more and more distorted as they approached *y*, where, on a top view, they were almost diamond shaped. As this was to be a cast gear, the problem was how to make the pattern with the teeth of the correct shape, and the cut and try plan seemed to be the only really practical one, and was accomplished about as follows:

The pinion blank was cast, turned, and the teeth milled in it for use in shaping the teeth on the gear pattern, the blank of which was also turned and both fitted to a rude sort of a jig, as shown in Fig. 3, consisting of a board *D*, with an upright *E* on one end, with a shaft *F* inserted for the pinion to work on, also a plug *C* fitted loosely in the board *D*, so as to be easily removed and inserted each time it became necessary to try the gear with the pinion, the hub on the under side being left off until the pattern was nearly finished. The idea was to make a master pattern of the gear, with the teeth largely of beeswax, and then have a white metal casting for a permanent pattern.

Approximations of the teeth were glued to the blank and whittled until, when the

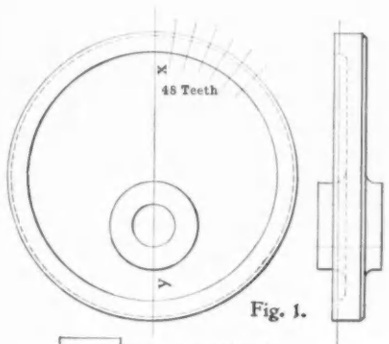


Fig. 1.

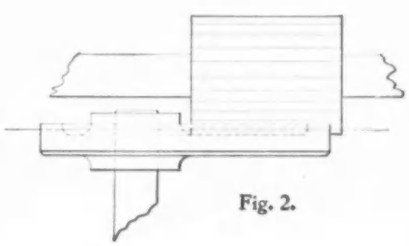


Fig. 2.

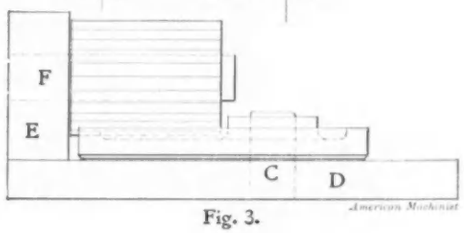


Fig. 3.

AN ODD GEAR, AND RIG FOR MAKING IT.

spur was revolved on its shaft in the jig, the gear would turn also, then beeswax was plastered on, and the spur, previously heated, would shape the wax, and the revolving process would continue.

After the expenditure of considerable time and patience, quite perfect teeth were molded by the warm spur, except having, of course, rather ragged ends, which were removed by chucking the blank in the lathe and squaring down the edges of the teeth.

Wax will turn beautifully if care is used in holding the tools, and a smooth, shining surface like glass is the result.

After the pattern was finished and varnished it went through the foundry, and showed hardly a scratch on the wax as the result. My impression is that two castings were made from it in iron and one in white metal, the latter being intended for the regular pattern.

▲ ▲ ▲

Notes on the Definitions of Some Mechanical Units.*

BY WILLIAM KENT, M. AM. SOC. M. E.

The following paper has been suggested by recent discussions in the Society for the Promotion of Engineering Education, in which considerable difference of opinion was shown to exist between the physicists and the engineers in regard to definitions of the commonly used terms: force, mass, weight, etc.

If a body at rest, but free to move, whose mass is M, be acted on by a constant force, F, during a time, T, it will acquire at the end of the time a velocity, V.

The equation of the four quantities, M, F, T and V, is

$$F\ T = M\ V,$$

provided that the magnitude of the units in which these four quantities are measured, in any system of measurement, is such that the unit force is that force which will give the unit mass unit velocity in unit time, so that we may write

$$1\ F = \frac{1\ M \times 1\ V}{1\ T}$$

From the equation $F\ T = M\ V$ we may obtain the four equations:

$$F = \frac{M\ V}{T}. \quad (1); \qquad T = \frac{M\ V}{F}. \quad (2);$$

$$M = \frac{F\ T}{V}. \quad (3); \qquad V = \frac{F\ T}{M}. \quad (4);$$

and from these four equations we may obtain definitions of the four unit quantities, each in terms of the other three, as follows:

(1) Unit force is that force which will give unit mass unit velocity in unit time.

(2) Unit time is that time in which unit mass will acquire unit velocity when acted on by unit force.

(3) Unit mass is that mass which will acquire unit velocity when acted on by unit force for unit time.

(4) Unit velocity is that velocity which unit mass will acquire when acted on by unit force for unit time.

These four statements, however, are not really definitions. They are simply expressions of arithmetical equalities.

These definitions are examples of reasoning in a circle. The definition of each quantity is expressed in terms of the other quantities. We may have other definitions, however, in which each term is defined independently, without reference to the other terms.

Unit mass may be defined as the mass of a certain piece of metal, such as the British pound, or the gramme. Unit force may be defined as that force with which the standard pound is attracted to the earth at London, or as some fraction—say, $1 \div 32.2$ of that force; or, it might be defined as that force which will stretch a certain spring a certain distance, or, as that force which will elongate a certain steel bar a millionth part of its length. Unit velocity may be added as the quotient of a certain distance divided by a certain time, the distance being the length of a certain piece of metal. Unit time may be defined as 1-86,400th part of a mean solar day, or, as the time in which a certain pendulum makes one vibration at London.

Referring again to the equation $F\ T = M\ V$, and choosing our units so that the unit force is that force which in unit time gives unit velocity to unit mass, we may obtain the following statements of the relation of the four unit quantities, F, T, M V:

F	$\times$	T	$=$	M	$\times$	V
1 poundal acting		for 1 second		on 1 lb.		gives a velocity of 1 ft. per sec.
1 lb.		" "		1 second	on 1 massal	gives a velocity of 1 ft. per sec.
1 "		" "		1 second	on 1 lb.	gives a velocity of 1 gravital per sec.
1 "		" "		1 timal	on 1 lb.	gives a velocity of 1 ft. per sec.

The term "poundal" has been used by some English writers on mechanics. The terms "massal," "gravital" and "timal" have been invented for the purposes of this paper only. It is to be hoped that they will never be used in the text books, and that the term "poundal" will soon be expunged from those text books which have adopted it.

One pound force is the force with which gravity acts on the standard pound at London; 1 poundal is 1-32.19 of this force; 1 pound mass is the mass of the standard pound; 1 massal is 32.19 pounds; 1 gravital is 32.19 feet; 1 timal is 1-32.19 of a second.

Out of the four statements given above we may select those that are most convenient for any given purpose, such as engineering practice, and throw away and forget the others, since the unnecessary multiplication of formulas, terms and definitions only gives rise to mental confusion and error. In engineering, with English weights and measures, the third statement is practically the only one that is needed, and, translating the useless term gravital into its equivalent, we may write it: A force of 1 pound acting on 1 pound mass for 1 second gives it a velocity of 32.19 feet per second.

It may be convenient in electrical or stellar physics to use the dyne, or its multiple, the megadyne, but there seems to be no use in English measurements for the poundal, nor do we need any such terms as the gravital, the massal or the timal.

Prof. John Perry, in his work on "The Calculus for Engineers," London, 1897, says:

"I venture to say that there is not one practical engineer in this country who thinks in poundals, although all the books have used these units for thirty years."

The word pound is used in two senses, as the unit both of force and of mass (or weight). This need introduce no confusion, for whenever it may be necessary to make a distinction we may say a pound force, a pound mass or a pound weight.

We may rigidly define the pound force as the force which gravity exerts on the standard pound (a piece of metal) at London. The pound mass, or weight, is the standard pound itself.

It will be noticed that we cannot express the relation $F\ T = M\ V$ in terms of the pound unit of mass and force, the second of time and the unit of velocity 1 foot per second, but in the English system we have either to introduce the numerical coefficient 32.19 or 1-32.19, or else to invent a new unit such as the poundal, dyne, gravital, etc., in order to obtain an equation. If our unit of distance were 32.19 feet, instead of 1 foot, then we could express the equation without such a coefficient or new term, but the benefit would be infinitesimal in comparison with the confusion that would result from the introduction of a new unit of length. There is just as much reason, however, for using a new unit of length, such as a gravital, meaning 32.19 feet, as there is in using a new unit of force, such as the poundal.

The word mass, in what is said above, has been used in the sense in which it is used in the text books on physics, but it is used in another sense by most writers on engineering—namely, as the quotient arising from dividing the weight of a body at London by 32.19, or by dividing its weight (defined as the resultant of the attraction of gravitation upon it), at any other place by the acceleration

* Abstract of a paper read before the section of Mechanical Science and Engineering of the American Association for the Advancement of Science, Boston meeting, August, 1898.

due to gravity at that place, say, 32.16 at latitude 45 degrees at the sea level.

The difference between the physicist and the engineer is merely one of definition. There may be no objection to the physicist using for his own purposes the terms and definitions which he finds most useful or convenient, but it is an open question whether the physicist has the right to denounce the engineer's terms and definitions as improper, or whether it is advisable for the text books used in teaching mechanics to engineering students to use the definitions of the physicist instead of those of the engineer. The use of the term "poundal" is especially objectionable, for it is not used anywhere outside of the text books, in any art, industry or profession. Much confusion in the minds of students of mechanics would be avoided if the term were denounced and dropped from the language.

[We are glad to express our cordial approval of Mr. Kent's views of the entire uselessness of the term poundal, or perhaps we should say we are glad to publish his demonstration of its uselessness, for his paper is nothing less than a demonstration. His method is essentially that of reductio ad absurdum, since he shows that there is just as much need for such terms as massal, gravital and timal as there is for poundal, and no real need of any of them. Another practice of a piece with the introduction of this word poundal is the use by specialists in the testing of materials of the term strain in the sense of deformation. Professor Perry's words might be fairly paraphrased and applied to this term. We doubt if there is a practical engineer in this country, outside the ranks of the aforesaid specialists, who thinks of the word strain as meaning anything different from stress or load, or who can make himself think of the word as having any other meaning. We speak of the strain on a rope, or of a piece being under severe strain, meaning stress, and all the king's horses have not power enough to make anyone feel that the word is used otherwise than in its natural and correct meaning, and we doubt if the specialists who use it in the sense of deformation do so without a severe wrench to their ingrained sense of the real meaning of the word.—ED.]

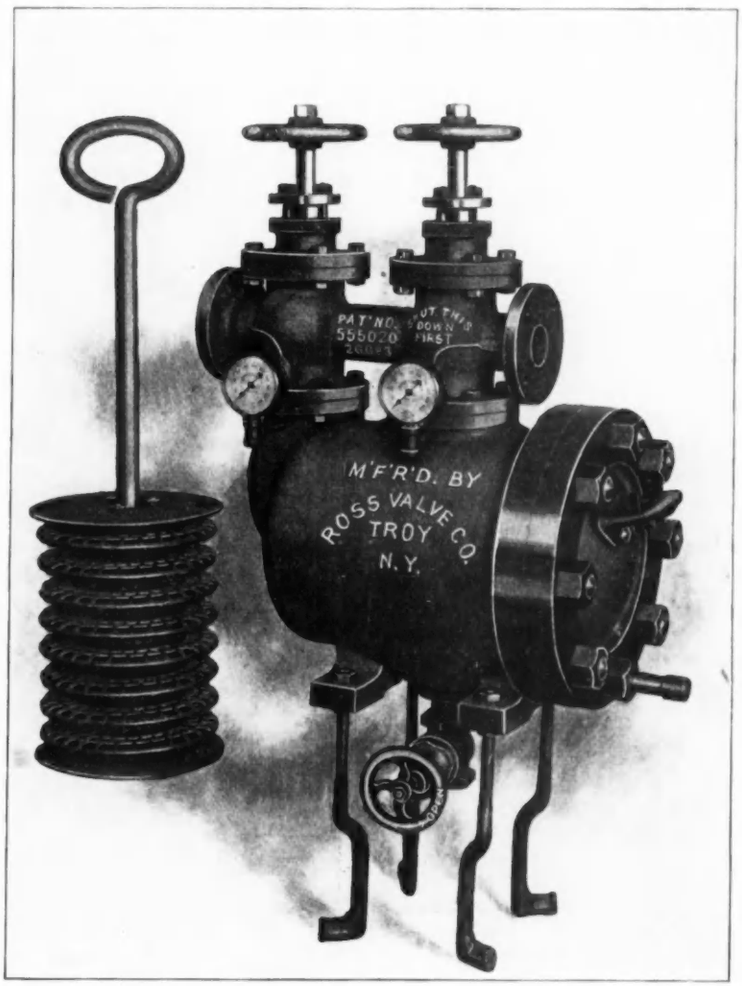
▲ ▲ ▲

The Ross Feed-Water Filter or Oil Separator.

The illustrations show a feed-water filter or oil separator already in extensive use upon transatlantic and other steamers, and which should be equally serviceable for stationary engines. Its function is to remove oil from feed water, where the water is used over and over and has already passed through the engine and carries more or less of the lubricating oil, which it is very necessary to exclude from the boilers. The filter is connected into and forms a part of the feed pipe, being located between the feed pump and the boiler.

Referring to Fig. 2, the operation of the filter will be readily understood. The valves of the filter are shown in position for the regular operation of filtering. The water enters the right-hand pipe at the top and passes down into the large chamber below. The central portion of this chamber is occupied by the filter, which extends horizontally the entire length of it. The filtering material employed is what is familiarly known as Turkish toweling, although it is manufactured in the United States. The skeleton of the filter is shown at the left in Fig. 1. This consists of light circular bronze sections of open lattice work, held together by long bolts, extending through the whole. The toweling, which is in the shape of a bag and much larger than the skeleton, is drawn over it and drawn down between each of the sections by means of strings wound around it. The filtering surface thus provided is very large, being from 250 to 1,000 times the area of the feed pipe, according to the service required. The water then passes slowly through the filtering material into the interior of the skeleton and out at the left-hand end, and thence to the boiler, as indicated by the arrows.

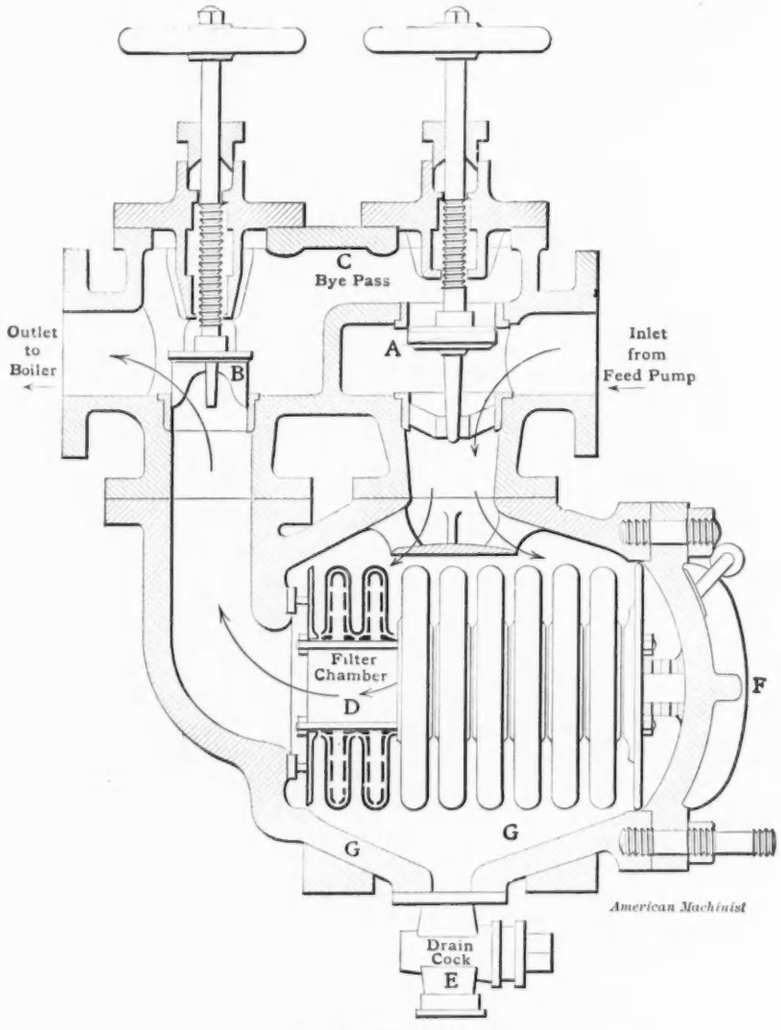
The oil or other matter separated from the water accumulates on the outer side of the filtering material, and in time begins to offer appreciable resistance to the free flow of the water. This resistance will be indicated by the difference in the reading of the two pressure gages shown in the half-tone, and when this difference reaches two or three pounds the filter may be cleaned by reverse washing in position or by changing the filter, a spare one always being provided. It will be noticed that valve *A* has a face on both its upper and its lower corner, and that it seats upon both the upper and lower bushings. If the valve is screwed down the feed water passes to the boiler without passing through the filter. If valve *B* is then closed and the drain cock at the bottom opened, the head *F* may be



THE ROSS FEED-WATER FILTER.

taken off, the clogged filter removed and the clean filter inserted, the entire operation usually not taking more than five minutes.

For washing the filter without removal valve *A* is first closed, or screwed down, and then *B* is closed and the drain cock is opened. Valve *A* is then opened a little, and the current thus created around the filter washes the outside of it. By shutting valve *A* and opening *B* the current is made to wash the interior of the filter, or to wash through it from the inside. The long rod attached to the spare filter is merely a handle used to place it in position, and is unscrewed and removed before the cover is put on.



SECTION OF FILTER.

The filter is made amply strong for the highest pressures employed in modern practice, being tested at 500 pounds. It is built by the Ross Valve Company, Troy, N. Y.

▲ ▲ ▲

The Hamburg-American Line recently placed an order for a new steamer which is to be provided with double sides, designed to afford additional protection.

Letters from Practical Men.

"German" Circulars.

Editor American Machinist:

I have in my time murdered the Kaiser's fearfully and wonderfully made language most horribly, although with no foul intent; but this has been principally orally, and I question very much whether in my most helpless and desperate moments I have committed so many foul linguistic deeds as are on record in some of the so-called German circulars which reach me here from "God's country." I have before me one which is quite expensively gotten up, and which is supposed to describe a pipe threading and cutting-off machine, but which does not, by several jugs full, either metric or other system. In quoting the judges' award at Chicago the makers of the machine are made to say that the award was for a "combined *steam engine* and hand machine," and so on all through. I have just received a brick machine circular which uses the German word for "to die" instead of that for "to cut off," and calls some part of the machine the "surveyor strap." Most Germans can understand good English better than such German.

ROBERT GRIMSHAW.

Dresden, Germany.

▲ ▲ ▲

Gas Engine Details.

Editor American Machinist:

The article in your issue of September 22 on "Some Points in Gas Engine Design" contained some suggestions which, in the writer's opinion, would hardly improve the modern gas engine, though if the author of the above article can show advantages by using the ideas proposed, in actual engine performance, we will be only too glad to get a report of his results.

The use of a single piston valve in place of two or more poppet or mushroom valves is not new, and its advantages are questionable. When new such a valve may work satisfactorily, but the experience of the writer has been that a piston valve for a gas engine, though simpler than two poppets, cannot be kept tight for any length of time.

It is generally conceded that a piston valve in a steam engine is less liable to leak when in motion than when at rest; but in a gas engine the piston valve must be at rest when compression and expansion take place, and if it is tight enough to hold from 200 to 300 pounds it will be too tight to move freely under the different changes of temperature incident to the cold admission and hot exhaust gases. Valve rings might be used, but would they not be more apt to leak than the piston rings, which the author of the article above referred to proposes to reinforce with soft packing? Would not a better way be to have the piston rings made tight in the first place, obviating the necessity of fibrous packing, which causes friction and lasts but a short time? If soft packing must be used, why not dispense with piston rings entirely and return to old time Mississippi River steamboat practice?

Poppet valves are all right, and nearly all the successful gas engines use them. The admission valve requires no work to operate it, and the exhaust valve in small engines is easily worked, while in large engines the terminal pressure is removed from the valve, either by an auxiliary port uncovered by the piston at the end of the stroke or by a small valve seated on the main valve, which opens first. The best way, however, is to have no terminal pressure. Then the exhaust valve will open as easily as the admission valve.

The method of governing is not new. It is better, however, than throttling the mixture, but from an economical stand-

point is not as satisfactory as the hit and miss governor, for the reason that the compression is lessened as the charge is diminished, and, instead of running on from 20 to 25 feet of gas per horse-power hour (and a good engine should not use more), the amount of gas used will approach 90 to 100 feet of gas per horse-power hour, as the compression approaches atmospheric pressure, as in the Lenoir engine. Of course it may be necessary to sacrifice economy to get regulation, in which case the method of cutting off automatically a constant mixture, at such a point that the speed will remain constant, may be admissible.

C. E. SARGENT.

Chicago, Ill.

Fitting Crown Brasses Into Driving Boxes.

Editor American Machinist:

I venture to send you sketches showing the construction of gages for fitting crown brasses to driving boxes. The frames may be made of No. 14 or 16 iron or steel. The inside gage should be small enough to enter the smallest driving box in service, with range enough in the blades to gage the largest also. The female gage should be large enough to go over the largest crown brass and have range enough in the blades to gage the smallest. The blades are shaped as shown, and are made of tool steel ⅛ inch thick, with contact surfaces hardened. The clamp bolts have flat heads of uniform thickness, in order to bring the edges of the blade the same hight when laid on a piece of smooth, straight board made for the purpose in order to transfer angles and sizes from one gage to the other. The blades are secured by wing nut and washer, as shown.

The method of using the gages in fitting a crown brass to a driving box is as follows: The first step is to fit the inside gage to the driving box. The angles of the lugs *a a* are secured with the adjustable blades *b b*, and blade *c* is then adjusted until it touches the top of the driving box, as shown in Fig. 1. The gages, both inside and outside, are then placed on the board before mentioned, the boltheads

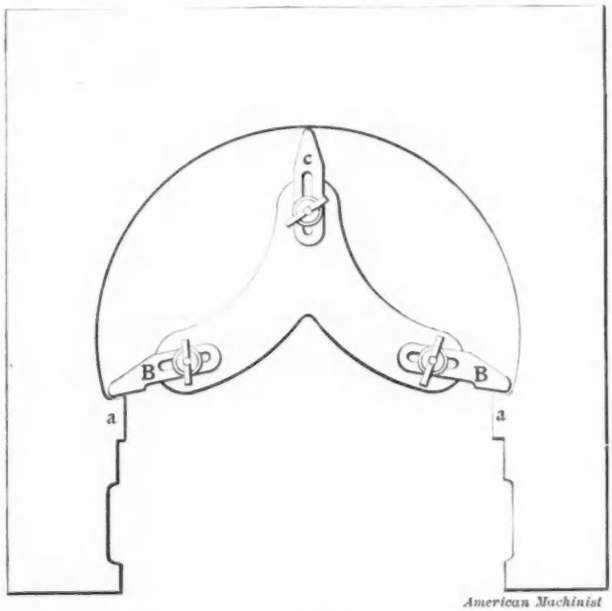


Fig. 1
GAGE APPLIED TO BOX.

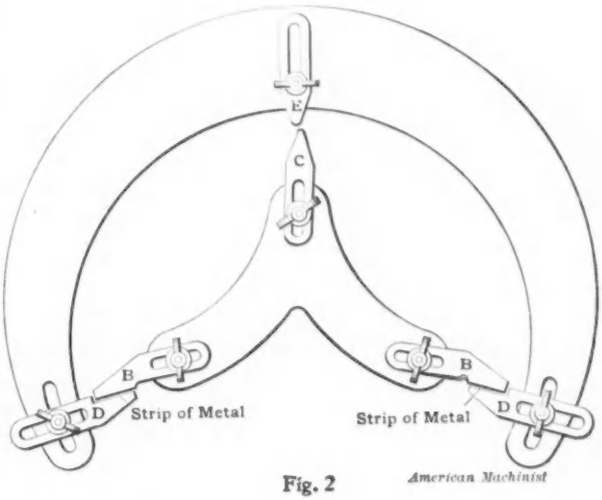


Fig. 2
TRANSFERRING THE ADJUSTMENT.

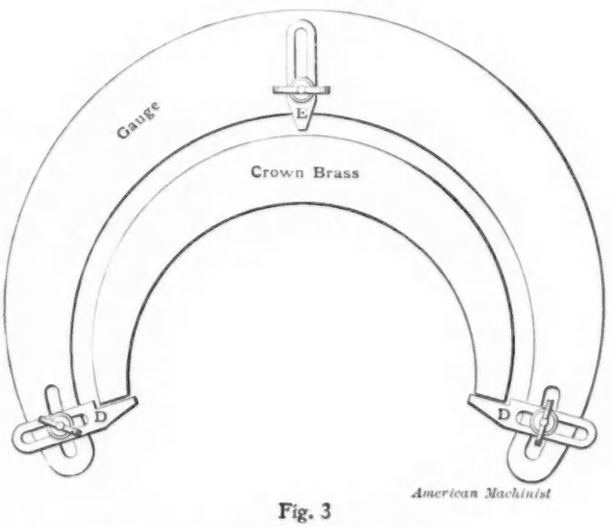


Fig. 3
GAGE APPLIED TO BRASS.

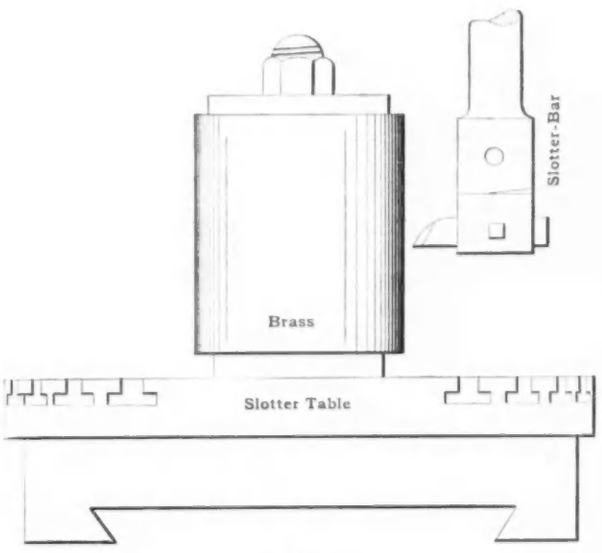


Fig. 4
SHAPING THE BRASS ON SLOTTER.

bringing all the blades in the same plane. Set the two blades *D D* to fit the bevel of blades *B B*; put a strip of tin or other metal, about .012 inch thick, between blades *B* and *E* and then set blade *E* to fit *c*, as shown in Fig. 2. By the insertion of the metal strip any brass slotted to the outside gage will measure .024 inch more in circumference than the driving box. The

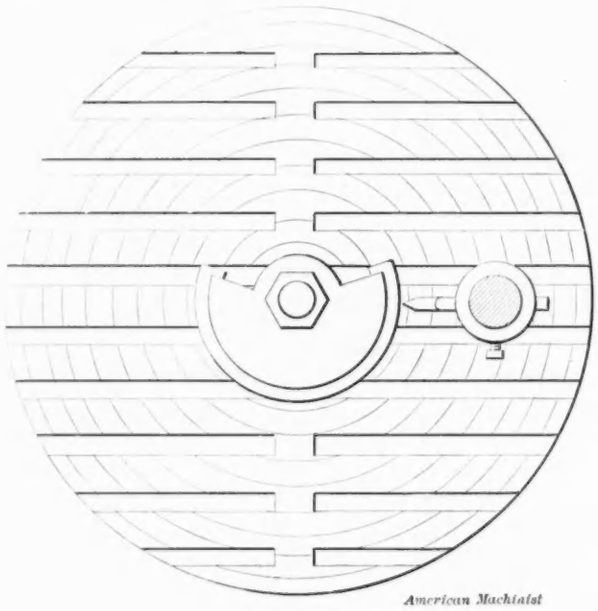


Fig. 5

PLAN SHOWING HOW THE BRASS IS HELD.

crown brass is to be slotted about .002 inch or .003 inch larger in outside diameter than the interior of the driving box. The crown brass can be slotted while the gages are being set for the driving box. After slotting the brass on the circumference chalk the ends of it, and, setting the outside gage upon the brass, scribe the angles of the ends, as shown in Fig. 3.

The allowance, as stated, .024 inch on the circumference and .003 inch on the diameter of the crown brass, will make a pressure fit of 10 or 12 tons on the average box. One or two trials will enable any machinist to get the pressure required, and it is possible to fit whole sets of brasses without having to press any out for easing off.

The method of holding the brass on the slotter will be understood from Figs. 4 and 5, the prevailing method being as shown.

R. SAFELY.

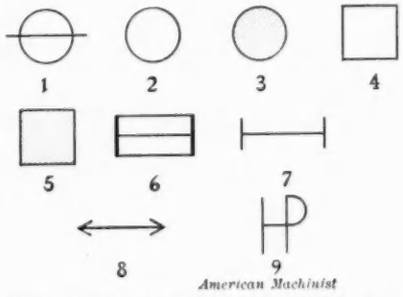
▲ ▲ ▲

Convenient Signs.

Editor American Machinist:

One thing which I have learned from the Germans is the use of a circle with a straight line drawn through it and extending a bit on each side, to represent "diameter." They usually employ it with the straight line nearly vertical. I find, however, that this takes longer to make than like No. 1 in sketch, with the straight line horizontal, and the latter is also more conspicuous. Printers could lay a Greek φ down on its side and produce the effect.

The circle outline 2 to express circumference, and the hatched circle 3 for area, of a circle, are well known to users of Nystrom's and other "pocketbooks" (so-called because long, long years ago they would go in a breast or side pocket). Similarly 4 is used in Europe to express "sq." The pocketbooks use this outline square 4 for circumference of a rectangle and a hatched square 5 for area of a rectangle. Nystrom uses 6 for grate-surface and 2 for heating surface (in which lat-



CONVENIENT SIGNS FOR MEMORANDA.

ter he is not consistent, but the 6 is a good sign.

I employ in specifications, estimates, etc., the sign 7 to represent length (*i. e.*, lineal dimension), sometimes 8 instead.

It would be a good plan if the A. S. M. E. would pass on a series of signs to express frequently-written quantities. I have had the mark 9, which I thought was just as well known as the separated "h. p." and is a good deal more easily made, queried by a power-user; and once had "r. p. m." (which usually means rotations per minute, not revolutions, which are something else) sent back for translation.

G.

▲ ▲ ▲

Making Figures for Numbering Patterns.

Editor American Machinist:

In an article published in the "American Machinist" some months ago I described a system of numbering patterns which had been in successful operation several years. It may have occurred to

Fig. 1

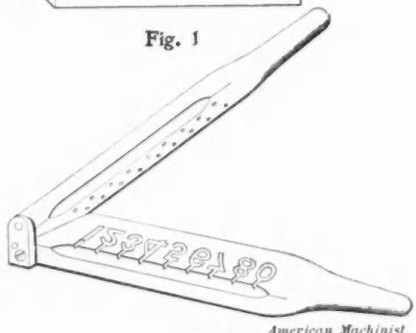


Fig. 2

A MOLD FOR PATTERN FIGURES.

some of your readers, as it did to me, when inaugurating the system, that the cost of the pattern letters and figures sufficient to properly number several thousand patterns would amount to quite an item, and one worth considering. The pattern letters and figures usually kept for sale have no ready means of permanently attaching them to the pattern. We may stick them on with shellac, but they will fall off or get knocked off. If we put them on with brads it necessitates two holes in each letter, and the cost of attaching them is more than the original cost of the letter. Therefore, even the first cost was not the only point to consider. Obviously to make them ourselves would be advisable if the outfit necessary would not be too expensive, since we could then get just what was wanted and whenever wanted.

The following plan was adopted and has been found to work well, and is economical both as to first cost and rate of production. A set of sharp faced gothic figures ⅜ inch high was obtained and fixed upon the shellacked surface of a board. Around this was placed a wooden frame, as shown in Fig. 1, and about ¾ inch deep. Plaster of paris was poured into this, after the board and figures had been slightly oiled, and when this cast, adhering to the wooden frame, was removed, we had a pattern for one side of a mold for casting the figures. This was sent to the brass foundry and molded in fine sand, so as to make as perfect a casting as possible, and this was cleaned up in the impressions of the fig-

ures, and the face was planed true, taking as light a chip as possible.

A counterpart of this was made, except that the face was plain and finished smoothly. These two parts were then hinged together as shown in Fig. 2. In the second part of the mold were drilled and reamed two holes for each figure, the holes being about 1-16 inch diameter at the surface, ¼ inch deep, and coming to a point at the bottom. By this arrangement sharp points were cast on the backs of the figures, by which they could be permanently attached to the pattern. The edges of both parts of the mold were chamfered to facilitate pouring the metal, and small notches or gates were cut to each figure. A simple spring clamp of wire, bent U-shape and slipped over the handles, held the mold together for casting.

An alloy of 9 parts lead and 1 part antimony was found by experience to work best. The molds were kept hot over a Bunsen burner, the heat being kept nearly up to the melting point of the alloy for several minutes after pouring to insure the complete filling of the mold, and it was then set aside to cool.

A similar mold was made for the letters of the alphabet (arranged in two lines for compactness), the gates running from one letter to the other, across the mold.

In a pattern shop there is usually a boy or young apprentice who does errands and makes himself generally useful around the shop. He can be utilized to do the work of casting these letters and figures, and when provided with molds such as described the cost is trifling compared with what it would be if they were purchased, and quite a quantity can be kept on hand for use whenever needed.

OSCAR E. PERRIGO.

New Haven, Conn.

▲ ▲ ▲

A Ready Made Drawing for Box Tools—Grinding Cutters for Box Tools.

Editor American Machinist:

The diagram or scale here shown has been used to advantage by me, for the purpose of locating the position of cutters in the box tool, as ordinarily used for turning brass in the turret lathe. It is seldom that the tool-maker receives a drawing of a box tool; usually he gets a blank turned in the engine lathe or a sketch of the piece to be made.

After selecting a suitable cast-iron blank for the body of the tool, turning the shank to fit the hole in the turret head, milling the wings true with the center line, and facing the end square, I bore for the cast-steel bushing, fit in the bushing blank, drill and bore the bushing to the size of the sample piece. Then comes the task of locating the cutters, to get the correct amount of facing for the various shoulders; the working points for the cutters being inside the bushing and a quarter to three-quarters inch of solid metal to cut through, the workman finds it is not an easy matter to locate the exact spot to drill the holes for the slotting tool to pass through the bushing, unless he makes a sketch of the piece to be made and "lays out" his cutters and the outlines of his box tool.

To plainly illustrate the use of the diagram, referring to Fig. 1, a sketch is shown of the piece to be made, the same being a brass composition casting with a chucking piece cast on the large end. The working drawing of box tool complete (Fig. 3) is shown merely to more plainly compare the diagram with the drawing.

The top line of the diagram represents a center line through any box tool, and the perpendicular line *O* is the face or front end of the box tool blank.

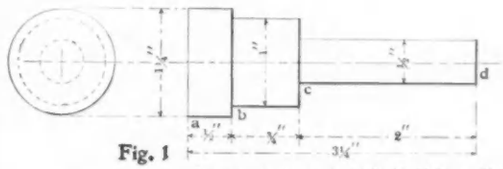


Fig. 1

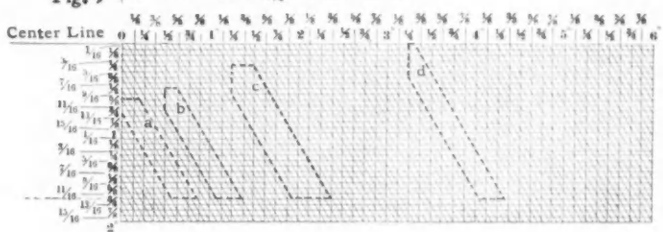


Fig. 2

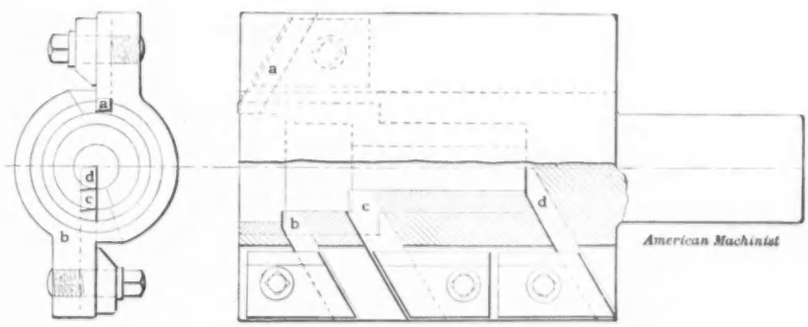


Fig. 3

A READY-MADE DRAWING FOR BOX TOOLS.

To find the position of tool for cutting the second diameter of sample piece, and facing the shoulder *b*, trace with a pointer to the half inch graduation on the center line and half inch on the face line, and the intersection of the two will be the position of the point of the cutter; having a one-eighth inch shoulder to face, trace down three-sixteenths to line eleven-sixteenths, which will allow one-sixteenth clearance over the diameter to be faced; then the width of the tool blank being, say 3½ inches, find line one and three-quarters, which will represent the outer edge of the wing and follow the diagonal line from the eleven-sixteenths line to the one and three-quarters line, and the intersection of the two lines gives the point desired and the front edge of the cutter. All cutters being set at an angle of 60°, take as many of the diagonal lines as will give the desired width of cutter and you have the cutter complete, as shown by the heavy dotted lines in the diagram. After a little practice of a few trials, cutters of any diameter may be traced out very quickly.

I graduated a diagram like the sketch on a piece of sheet brass, polished not too smooth, and nickeled dull finish, which will permit of using a soft lead pencil to line out the cutters complete for a tool, and it can afterward be erased like one of Willie's warship pictures on a slate.

It occurs to me that a word or two as to the grinding and setting of box tool cutters, would not be out of place here. I have seen box tools condemned and nearly abandoned, and the workmen prefer the "hollow mill," all owing to improper construction of the box tool. The most important points to be remembered are the setting of all cutters at a fixed angle (that of 60° giving the best results), care in having the cutters fit the slots with no space at the edges for dust and chips to work in; leaving plenty of room

over the cutter and around the clamp for chips to escape, as well as a good-sized hole through the bushing and bottom of box tool body, for the chips that remain in the tool after running off the work.

Then, too, all cutters should be correctly ground by a man specially instructed for the work, gages made from one-sixteenth sheet steel for the proper angles of cutters and a rest fitted to the emery grinder, giving the correct clearance for cut. It is well to have steel blanks or samples of all regular pieces to be made by the box tools, for the purpose of setting cutters accurately.

I have no doubt, Mr. Editor, that some of your readers who read the latter part of my letter may say: "Well, any good tool-maker would know these things," which would, of course, be true. However, I have noted in shops visited that the box tool has been very badly abused, all owing, I am sure, to improper methods of construction.

D. E. MacCarthy.

Springfield, Mass.

▲ ▲ ▲

Handy for the Draftsman.

Editor American Machinist:

The little quadrilateral shown in the sketch is of more value and importance than might be thought at first glance. It is a very handy little thing for the draftsman to have. If he is a practical draftsman it will be dumped into the drawer with the compasses, triangles, pens, pencils and such things that he uses every day and is liable to want any minute. The way that I came to hit it was like this: I often have to draw some curves that are neither round, oval, hyperbolic nor anything else with any semblance of regularity. I have the usual experience in trying to get some of the stock curves to match, and I often get disgusted with my ill-success. My experience has led me to keep on hand some thin stuff from which

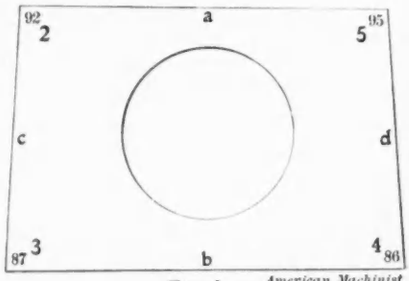


Fig. 1

FOR SMALL ANGLES.

I can in a few minutes cut out precisely the curve that I require. It is much easier and quicker than any other way of getting along with this familiar trouble of the draftsman.

I not only have to draw curves that none of the familiar instruments will describe, but I also often have some of the same trouble with angles. Angles of one or two or three odd degrees can of course be laid out, or you can have a set of angle strips or triangles always on hand, but something simpler and readier is what is wanted. It was the most natural thing in the world for me to turn to my stock of thin stuff and settle the thing once for all.

The result is shown in the sketch. This is always ready for angles of 1, 2, 3, 4 or 5 degrees. A handy size for it would be 6 inches for the larger dimension, and it would be well to make it of transparent celluloid, which I find most satisfactory for triangles. Sides *a* and *b* are not parallel, but if produced to meet would include an angle of 1 degree. The angle at *e* is 2 degrees more than a right angle. The angle at *f* is 3 degrees less than a right angle, at *g* it is 4 degrees less than a right angle, and at *h* the difference is 5

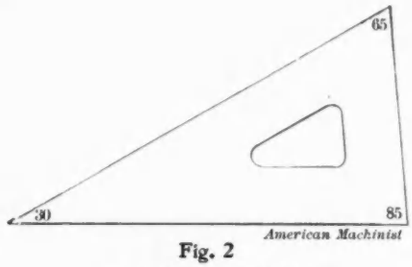


Fig. 2

A HANDY TRIANGLE.

degrees. The angle included by sides *c* and *d* is 7 degrees. No instruction is needed in the use of this, as anyone can see that, in connection with a right-angled triangle and T-square, and by turning it over one way or the other, the several angles indicated may be laid off.

Readers will remember how a couple of years ago the enterprising contributors to the columns of the "American Machinist" were looking for a third triangle, by the aid of which it would be possible to divide a circle into 5-degree angles. The triangle shown here is an outgrowth, rather a slow one, of that discussion. The thing can be done with two triangles. With the triangle shown here in connection with a 45-degree triangle, a T-square and a board whose two working sides are square, it is a simple thing to divide the circle into seventy-two divisions of 5 degrees each, and if the quadrilateral here shown is also thrown in the circle may be divided by single degrees all the way around, or into 360 equal and true divisions. It is not proposed to adopt this system if there is much dividing to be done, but for the occasional production of an odd angle it should be found handy. These suggestions of improvement that come to us in the columns of the "American Machinist" keep working on us and in us whether we will or not, and when they do seem to lead to something, if not apparently of great importance, I suppose it is well to pass it along.

Morris Fulton.

Forming Die for Sheet Metal.

Editor American Machinist:

I send you herewith a sketch of a die for forming pieces of sheet metal, tool steel, similar in shape to Fig. 1.

While there is nothing unusual in the

Fig. 1

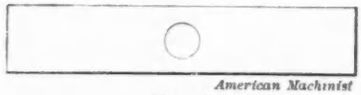


Fig. 2

THE BLANK AND THE WORK.

construction of the die, the method of making the punch and the operation may be of interest to some of the readers of the "American Machinist." It consists of a plain punch with a pressure plate in the centre actuated by a spring to force the metal down to the bottom of the die in the middle before the corners of the punch come into contact. The cutting

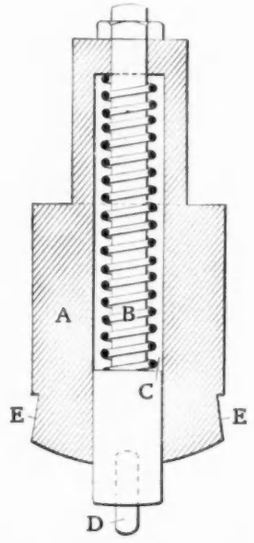


Fig. 3

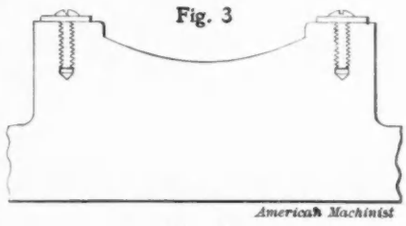


Fig. 4

FORMING DIE FOR SHEET METAL.

away of the punch at *E E*, Fig. 3, gave us a much better vertical bend.

This operation we found to be necessary after repeated trials with plain punch and die, in order to prevent the breaking of the stock at the corners.

The blank was cut out of 18-gage stock, perforated and blanked at one

stroke of the press. The bending punch *a*, Fig. 3, was made of tool steel hardened and the temper just started. *B*, Fig. 3, is the pressure plate, the end being of the same radius as the punch.

The spring *C* must be made strong enough to keep the pressure plate down until it comes in contact with the die. *D* is a pilot pin which enters the hole in the blank.

Fig. 4 is the die, which should be hardened and not drawn.

With the use of oil on the work the formed pieces will come out of the die very easily.

DIE MAKER.

▲ ▲ ▲

Can We Feed a Boiler for Nothing?

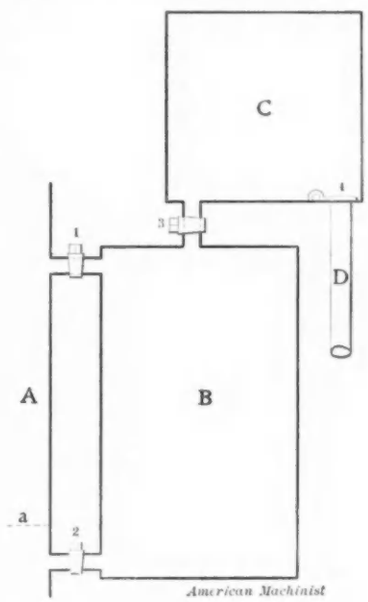
Editor American Machinist:

I see that the question is coming around again about the injection water for a jet condenser. I was puzzling over it at least thirty years ago. When a condensing engine is running there is a tolerably uniform vacuum, or partial vacuum, maintained in the condenser. The steam after each stroke of the engine keeps rushing into the condenser, and the injection water also rushes in, and by its abstraction of heat from the steam immediately condenses it. The rush of the injection water into the condenser is in consequence of the vacuum maintained within it. The function of the air pump in connection with the maintenance of the vacuum need not here be referred to. The water is driven into the condenser by the excess of pressure outside over that within the condenser. The difference of pressure without and within the condenser is so great that the water may be forced up, say, 20 feet before it is high enough to enter the condenser and still enter with considerable velocity and force. The water supply may, indeed, be on a level with the condenser, or even it may be any hight above the condenser, so that upon opening a valve the water would flow into the condenser by the force of gravity alone and without the assistance of any vacuum in advance of it.

Now, for a given weight of steam to be condensed a certain quantity of water will be required, and this quantity of water will be the same no matter what may be the circumstances attending its entrance into the condenser, whether from a level above the condenser, from nearly the same level as the condenser or from 20 feet below it. In the last case there is evidently more work done on the water to raise it to the level of the condenser than in the other cases, but how is this work paid for? What corresponding loss of power is there elsewhere to balance it? No more water, apparently, is used in either case; the air pump has no more work to do in pumping the water out, there is no difference in the vacuum maintained, so that it would seem that here quite an appreciable amount of work is done for nothing, so far as the net work developed from any given weight of steam at given pressure is concerned.

It is a rather curious thing that at the beginning as well as at the end of the series of operations involved in the use of water in connection with the development of power from steam there is an interesting question as to the power cost of moving the water to the place where it is required for use, or from the source of supply into the boiler.

The most general practice is to force the water into the boiler, and against the pressure within it, by mechanical means, as by the use of a force pump. It is not for a moment to be disputed that this method costs something. We may have



BOILER FEEDING DEVICE.

a large and highly economical engine driving the shafting of a factory, and power may be taken from the shafting, by belt or otherwise, to drive a power pump, or we may use a direct-acting steam pump, with full pressure steam following the piston for the full stroke, and with large clearance spaces to fill besides, but in either case the direct power cost of the operation is evident and indisputable. In too many cases the means employed for boiler feeding are distinctly wasteful of steam or of power, and are often far out of character from the minutely economical arrangements elsewhere adopted throughout the plant.

Now, say that instead of any pump, or similar device, whether economical or wasteful of power, we have the apparatus crudely shown in the sketch. Let *A* be a steam boiler, carrying steam at any practicable pressure, and *a* the lowest level at which it is desired to carry the water. Let the vessel *B* be connected to *A* by the two pipes shown, the lower pipe always connecting with the water in the boiler and the upper one always connecting with the steam space, cocks being provided in each pipe. The top of *B* is connected by a vertical pipe, also provided with a cock, to the vessel *C*, which is connected by the pipe *D* with the water supply, this pipe having the check valve 4 where it enters *C*.

This embodies all the essential features of the apparatus. Say that steam is on the boiler and that the water has fallen to a level where it is desirable to replenish. It is assumed that *C* contains water, not that it is necessarily full, but probably nearly full. If cocks 1 and 2 are closed and 3 opened some water will descend from *C* into B and the steam in *B* will be condensed, thus forming a vacuum therein and causing then a rush of water from *C* to *B* and also causing water to ascend pipe *D* in quantity sufficient not only to nearly fill *B*, but also to replenish *C*. If now cock 3 is closed and 1 and 2 are opened the free communication between *A* and *B* is re-established, leaving the water in *B* free to flow into *A* until the common level is reached, thus raising somewhat the level of the water in the boiler. The operation may be repeated as often as may be necessary to maintain the level of the water in the boiler.

It is a very simple problem to make this action entirely automatic. A float may be provided in *B* which will trip the necessary valves at each limit of its travel up or down. In fact, devices of this character are no novelty, although they do not seem to be in extensive use or even to be widely known. And it is rather a wonder that they are not better known and also that they are not the standard rather than the rarely exceptional means adopted for boiler feeding. In the action of this apparatus it is not easy to see, any more than in the case of the injection water entering the condenser, how any power, or the equivalent of power, is lost in the operation. The possibilities of power development all reside in the heat that is carried by the steam, and certainly no heat is lost to the system, as whatever is abstracted from the steam is given immediately to the entering water, and the water is thereby advanced so much further toward its conversion into steam, which is its ultimate destiny. There will of course be some loss of heat by radiation from *B*, but this may be mostly prevented by suitable clothing, and such loss of heat is of a part with the radiation that constantly goes on from the boiler, and has nothing really to do with the cost of feeding. Conceding this slight loss of heat as inevitable, there seems to be nothing else that will not justify us in asking the question: "Can we feed a boiler for nothing?"

TECUMSEH SWIFT.

AMERICAN MACHINIST

Published Thursdays by

American Machinist Publishing Co.,

256 Broadway, New York.
JOHN A. HILL, President and Treasurer.
C. A. HANSMANN, Sec'y.

Editorial Department.

FRED J. MILLER, Chief.
FRANK RICHARDS,
F. A. HALSEY,
EDWARD P. BUFFET, } Associate Editors.

Advertising Department.

C. P. DAY, Eastern Representative.
J. M. WAKEMAN, Western Representative.

Space in advertising pages only is for sale.
We invite correspondence on subjects pertaining to machinery.
Name and address must always be given, though not necessarily published.
Communications for or relating to the reading columns should be addressed to the Editor. All business communications should be addressed to the Company.
Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrappers denotes week with which subscription expires.

Subscription Price:

$3.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

$4.00 a year to other countries, postage prepaid. Entered at Post Office, New York, as second-class mail matter.

For Sale by Newsdealers, Everywhere.
No back numbers beyond 1897.

▲ ▲ ▲

The Technical Journal as a Newspaper.

There are those, not a few, who think of a technical journal as something as different as possible from a newspaper. The fact, however, is that the technical journal which does its readers the best service, and which is truest to their interests, is a newspaper first of all. This is so, because in the trades, and nowhere more so than in the work of machine construction, the supreme instructor is the man who actually does things, and to tell of what he does and of how he does it, of the perfection or deficiencies of his work, and of the rate at which he turns it out, is to convey both stimulus and instruction more completely and concisely than by any other means known. Speculations as to how things might, could, would or should have been done are well enough in their way, and sometimes necessary, too, but these are partial and preliminary; the thing done embodies all this and much more, and carries its lesson complete. The wisdom of the world indorses this. The man who does, or who leads men individually or collectively to do, is the great man. History is the supreme teacher, and history tells only of things done.

We are constant and true to this conviction. Each issue of ours is intended first of all to carry mechanical news. We tell continually of what is latest and best in mechanical achievement. Our score of volumes is the most complete existing history of the progress in machine construction, especially in America, for the years that they cover.

This is intended not at all in the way of self laudation, but to suggest to our many friends how they may most profitably continue to help us. We are happy in the co-operation of a host who are more than well wishers; they are disposed also to do for us all that they can, just as we would do all that we can for them. The one thing to do for us is to tell us the real mechanical news and as much of it as possible; all about the new machine, or, often, some ingenious or ingeniously simple detail of a machine, that accomplishes what was never done before, or that does the old thing in a better or a quicker way. There are new jobs coming along continually, and we and our readers want to know how these things are done. There are improvements in tools every day, and in the ways of making and using them, which it is our business to know and to make known. These things will not come of themselves; they will not come in full measure from a few, however skilled or favored, and they will not come from any favored section of the land. They must come from everywhere and they may come from anybody. We want them, and we are able and more than willing to put them where they will do the most good.

After we have all the shop news and information that we can get there is room and provocation for all styles of supplementary suggestion. Not only does one thing lead to another, but the combinations of them lead also to still newer revelations of possible achievement. Criticism of means and methods is prolific of progress. So, if we cannot always tell of something done, it is still and always next in order to tell how things may be done. And if we have need of doing something better or something different, and do not know how, there is always a chance to ask for help, and it is quite likely to be forthcoming. The opportunities for mutual help which our columns afford are infinite if availed of.

▲ ▲ ▲

New Tools in Old Shops.

A machinist who buys a new machine tool should feel proud of it. If he does not, there is something wrong with the tool or the machinist, or both.

But while unwavering constancy is very desirable in some things, this is a matter in which one's feelings may properly undergo a change, and there usually comes a time in the life of every machine tool when its owner should be ashamed of it, rather than proud of it. This time comes when materially better machines are to be had—machines which are capable of materially reducing shop costs. It is to be remembered that although pride in one's shop and its equipment is a good, if not a vital thing, it must have a substantial basis. Price lists and discount sheets make no allowance for it, and no competitor is less eager or less able on account of it.

There are shop proprietors who cannot imagine how builders of modern improved machine tools can afford to advertise them as they do. These shop proprietors are mostly of the class who never buy an improved tool so long as the work can by any possibility be done with old ones, and they imagine others do not do so. They cannot comprehend that the reason why a man who makes a good tool can afford to pay for advertising space in which to tell about it is that there are lots of people carrying on machine shops here and in other countries who are interested in knowing what improved machinery may be obtained, and what can be done with it in the way of improving products or reducing costs. These people are buying improved tools as fast as circumstances allow. If they were not doing so, it would, of course, not pay to buy space in the advertising pages of this journal to tell them of these new machines and their advantages, and the inter-related facts mentioned have an important bearing upon the art and business of machine construction as carried on at this latter end of the nineteenth century. He who does not understand them and their bearing upon the situation he has to face is likely to experience what has been referred to as "a rude awakening."

It is a familiar fact that modern methods of doing lathe work, for instance, will in some cases reduce the time required to machine a piece of work by from 50 to 90 per cent.; it is not so familiar, though equally true, that it makes quite a difference whether one adopts and makes full use of the best methods early in the game or waits until it is nearly played out, and prices based upon lower costs force him to improve.

Machine tools that are "as good as ever" must sometimes be gotten rid of and new shops, or those which are being enlarged, are by no means the only ones which should be large buyers of the most modern tools.

▲ ▲ ▲

Inquiries for Machinery.

Those who make or may know of the makers of such machinery as is called for below will oblige us by sending name and address, mentioning the number of the inquiry. We cannot forward catalogs. We have inquiries as follows:

70—For machines for printing on 28-inch barrel staves.

71—For the makers of what is known as the Sanderson screw stock.

72—From England, for a machine to

straighten thin strips of steel from 3 to 5 inches wide.

▲ ▲ ▲

Obituary.

Carroll Oves died at Reading, Pa., October 8, sixty-six years old. He was formerly an engineer of the P. & R. Railroad, and for many years had carried on a small machine shop of his own.

William G. Morris, senior member of the firm of Morris & Barlow, malleable iron founders, of Newark, N. J., died suddenly in Philadelphia, October 5, while attending the convention of the Foundrymen's Association. Mr. Morris was educated in the public schools of Newark, and began his mechanical career as an apprentice of Seth Boyden.

▲ ▲ ▲

Death of F. F. Hemenway.

Frank F. Hemenway, who was for nearly fourteen years connected with the editorial department of the "American Machinist," and for several years its editor-in-chief, died in Brooklyn, October 14. He was born at Hartford, N. Y., October 29, 1837, and received a good common school education. He served a regular apprenticeship as a machinist at Keene, N. H., and then worked for some time at the Putnam shops, Fitchburg, Mass. At the beginning of the civil war he enlisted, and served under Gen. N. P. Banks in the Southwest. After leaving the army he found employment at his trade in various shops in different parts of the country. The beginning of the 70's found him in the Troy & Boston R. R. shop (now the Fitchburg), Troy, N. Y., and there he was intimately associated with the late Geo. W. Richardson. He did the work and experimenting connected with the inventing and perfecting of the Richardson pop safety valve, and had also much to do with the development of the Richardson balanced slide valve, and other inventions. He went to the works of Starbuck Brothers, Troy, then still large and prosperous, in connection with the more extensive manufacture of the pop safety valves, and after a year or two became foreman of the machine shop there, and held that position as long as the works kept going. While connected with Starbuck Brothers he invented the Hemenway automatic cut-off engine, a stationary engine of the first class, of which several were built, all doing good service, but no permanent business was developed in them. While still residing in Troy he became a charter member of the American Society of Mechanical Engineers.

Hemenway became an appreciative reader of the "American Machinist" with the first volume of it. His contributions, which were first called out by those of other writers, began to appear in its columns in 1879. They treated of steam and the steam engine more than of any other topic, and culminated in the production of his book on the steam engine indicator, which was first published in 1885, and is still selling. He became associate editor of this paper in July, 1881, and upon the death of Jackson Bailey, which occurred July 7, 1887, he became the editor. This position he resigned in October, 1894.

Beyond this meagre outline it is a most difficult task to write of the life and death of Frank Hemenway. His abilities have made their own record. He was an excellent, all round, practical mechanic. His information was wide and marvelously correct, and his judgment more than kept pace with it. The word that came from his pen or his tongue was never misleading. Personally he was a true friend. He was kind and actively helpful to all with whom he was associated. He did good and not evil all his days to all he met in the walks of business. The bitter word that it seems necessary to say, without reproach and without sitting in judgment, is that he was not kind and he was not just to himself. Much more than a fair share of this life's misfortunes fell upon him. He contended bravely against them for years, all the while helping others to bear their far lighter burdens, and he gave up only when further battling was plainly hopeless. He was married while quite young, and the three children born to him are all dead.

▲ ▲ ▲

Personal.

Mr. Albert H. Walker has moved his office from Hartford, Conn., to 100 Broadway, this city.

Thomas E. Inslee has resigned as assistant superintendent of the foundry of the H. B. Smith Company, Westfield, Mass. He is succeeded by Arthur A. Brown, of Champaign, Ill.

Mr. J. Robert Fortune, formerly chief draftsman for the Murphy Iron Works, Detroit, Mich., has resigned his position and is now in charge of the drafting department of the American Stoker Company, New York city.

Our occasional contributor, Mr. D. E. MacCarthy, who was formerly with the Detroit Lubricator Company, Detroit, Mich., and more recently at the Springfield Armory, has taken a position as machine designer with the Ott. Mergenthaler Company, Baltimore, Md.

▲ ▲ ▲

Superstitions About Iron.

In Egypt iron was nominally accursed, even when people used it all day long and every day. It was "the impure metal"—"the bones of Typhon," father of evil. No man could touch it without sin; he must do penance and make atonement. That was the theory as long as the Egyptian race endured; in practice iron had been handled freely for several thousand years. The only piece of metal found in the Great Pyramid was an iron bar. The same conflict of ancient faith with growing convenience was urged everywhere, no doubt; but the record does not exist. It was lost before the classic time, and so Greek and Roman sages puzzled over odd little customs handed down from days of old. Cicero asked in vain why a tool of iron must not be brought into the sacred grove of the Arvals—or if brought by accident must be expiated by the sacrifice of a pig or a lamb; and Plutarch wondered why the Archon of Platæa might not touch iron except at the yearly festival commemorating the triumph of Greece. There is no end to such instances. The sacred old Pons Sublicius had to be repaired without using iron; so had the ancient temple of Jupiter Liber—in imperial times, when the meaning of such rules was lost, a special law abrogated them.

One may survey mankind from China to Peru and find the same superstition everywhere. Iron tools were forbidden in the building of the Temple at Jerusalem; the late Rajah Vizanagram, a member of the council, a man of great learning and enlightenment, would not allow iron to be used in any building throughout his territory. He believed that an epidemic would follow. Negroes of the Gold Coast must remove any articles of iron on their persons when consulting the Fetish. Upon the other hand, a Sikh must always have a piece of steel or iron about him. Burton tells how "the pious Moslem stretches out a finger exclaiming, 'Iron! oh, thou ill-omened one!'" when a dust storm approaches the caravan—believing it to be directed by a Djinn.

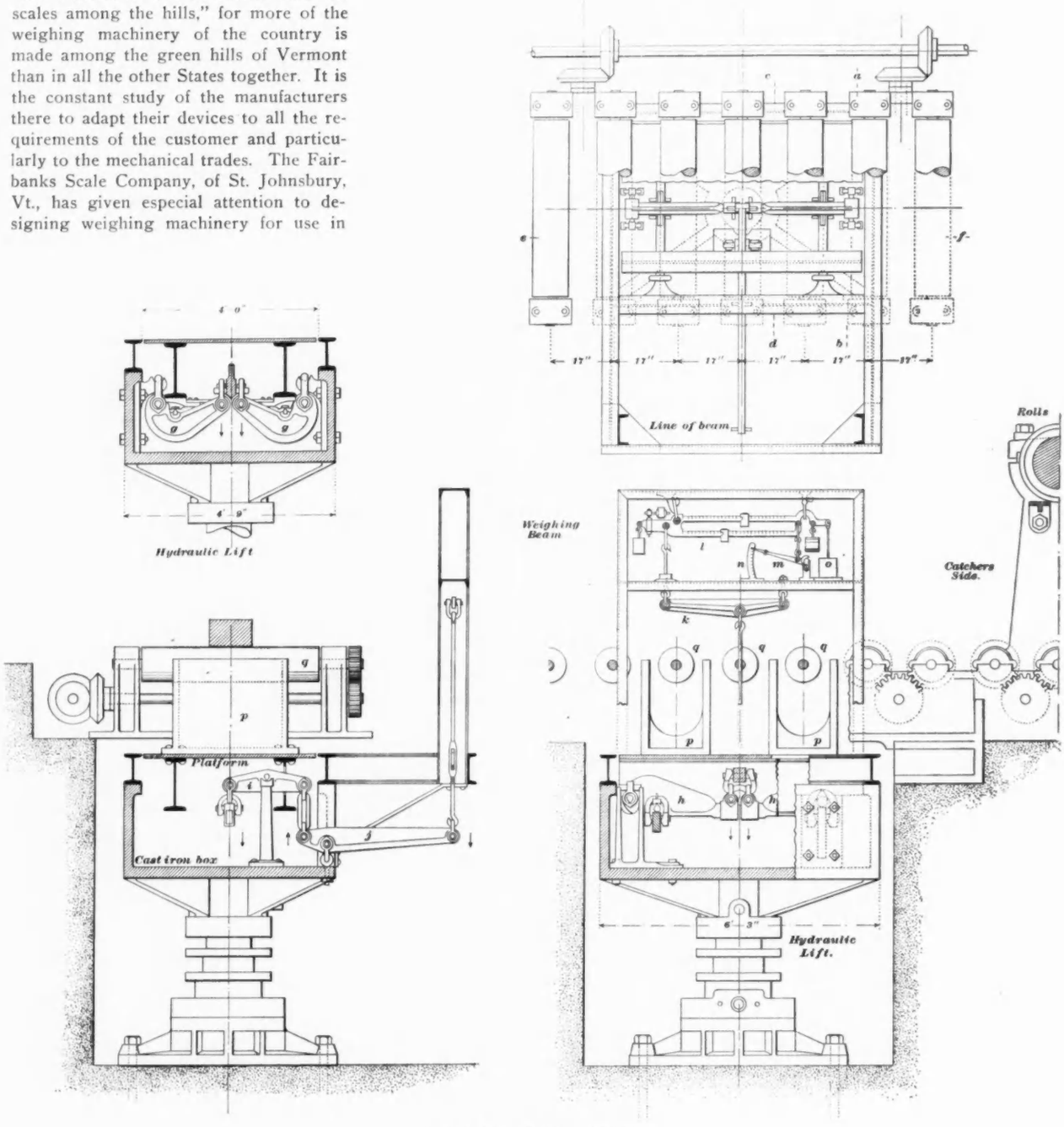
In Scotland many traces survive. To use iron in kindling the "needfire" was awful impiety. When a fisherman swears during bad weather at sea his comrades still grasp the nearest bit of metal, crying, "Cauld iron." It is not so long since people thrust a nail or a knitting needle through each article of food in the house, or dipped it in the liquor, when a person died. This is enough—persons interested in the subject will find reams of evidence in books devoted to folk-lore. We may credit that the superstition arose everywhere at the time when fierce invaders, armed with iron, overran the country, massacring the helpless people and destroying the antique religion. It was the accursed metal. Afterward, by a natural process, the evil thing often came to be regarded as a protection against other evil things—witches and demons and charms and death itself. English babies were defended from fairy kidnappers by putting a key, knife, pair of tongs, above all, scissors, in the cradle. In many of those pretty tales dealing with a "swan maiden," the girl cannot recover her plumage because it is locked in a chest with an iron key—sometimes she gets a mortal to open the chest, and flies away upon the instant. In other stories she is released by a touch of iron; in one favorite version by the husband throwing his bridle at or to her—the iron bit is fatal.—*London Standard.*

A Slabbing-Mill Scale.

BY W. H. SARGENT.

If the author of Deuteronomy, who wrote of "the mountains in a balance and the hills in a scale," had lived in this mechanical age, he would possibly have transposed his own words and told of "the balance in the mountains and the scales among the hills," for more of the weighing machinery of the country is made among the green hills of Vermont than in all the other States together. It is the constant study of the manufacturers there to adapt their devices to all the requirements of the customer and particularly to the mechanical trades. The Fairbanks Scale Company, of St. Johnsbury, Vt., has given especial attention to designing weighing machinery for use in rolling mills, blast furnaces and steel works. From the time the ore is dumped into the stack until it is loaded upon the cars in the form of a steel girder, each process is subjected to and governed by the action of a weighing scale. The ore, limestone, coal, etc., are weighed into the charge, the pig iron is weighed into the furnace, the melted metal is weighed into the converter, the steel ingots are weighed while almost fluid, the blooms, slabs and billets are weighed at such intervals as the work demands, the finished beam or rail is weighed to determine the weight per foot, and the steel is weighed out in carload lots for shipment, each of these different scales being the result of a careful study as to its fitness for its particular duty. Delicate balances are required for the laboratory, a scale has been designed for determining the percentage of moisture in the ore; the strength of the steel, tensile, transverse or compression, is tested by weighing the breaking strain; price lists and catalogs and even a letter inquiring the price of iron must be weighed in the balance.

The accompanying illustrations present a design for a machine used in connection with a slabbing mill, the scale itself being a miniature modification of their well-known track scale pattern. It is built into a hydraulic "manipulator," and upon the scale platform rest two lifters, the flanges of which reach up between



A SLABBING-MILL SCALE.

the rolls of the slabbing mill, as shown in the drawing. The slabs pass along on the rollers *q* above the scales, and when the weight is desired the manipulator is worked by hydraulic power until the lifters *P* pick up the slab so that it then rests upon the scale as upon the tips of one's fingers, when the weight can be quickly ascertained without stopping the roll train. The scale is in ambush, so to speak. It lies in wait, but not in weight. Being entirely inclosed in metal it is thoroughly protected against heat, scales and cinders. Every pivot bearing is suspended, so as to allow that perfect freedom of motion so essential to the correct working and continued accuracy of the scale. Where especially rapid weighing is desired the beam is fitted with a "quick-weighing attachment," which consists of a graduated arc *n* and a pointer *m* below the beam. This arc has an indicated capacity of 200 pounds, since it is presumed that the weighman can estimate the load within this limit. In operation the poise on the main beam *l* is set at the minimum weight of the slab, say 2,500 pounds. Then when the load is put upon the scale the indicator at once shows on the arc the excess over this amount, say 160 pounds, which must, of course be added to it, making 2,660 pounds. The dash-pot *O* is attached to the beam to absorb the vibration and allow the hand to quickly settle. No springs are used anywhere about the scales. In the drawing the arrow points indicate the direction of the motion of the various levers, and a few dimensions are given, sufficient to illustrate the general size of the mechanism.

▲ ▲ ▲

Sending Blue-Prints to Germany.

An American engineer at present in Germany writes us as follows: "Caution United States machine builders against sending constructive dimensions to Germans. These latter are very anxious for blue-prints to be sure that the machines are strong enough. I sent one an elegant set, all false sizes, and it cost them a lot for spoiled patterns and castings."

▲ ▲ ▲

A Machinist's Long Record.

Soloman Morris, Troy, N. Y., has entered upon his fiftieth year as a machinist. He began work in the Tompkins shop in Troy October 5, 1849, and has worked there continuously ever since. He is seventy-four years old, and has accumulated considerable property

▲ ▲ ▲

Several readers have called our attention to the fact that limber indicator springs with limiting stops, as described by Mr. Bollinckx in our issue of October 6, were used by the Committee on Exhaust Pipes and Steam Passages of the Railway Master Mechanics' Association, whose report will be found in the Proceedings of the Association for 1896. An indicator with its spring fitted in this way was applied to one side of the locomotive under test in order to indicate the back pressure more accurately. Reproductions of cards thus taken, together with others taken simultaneously from the opposite side with an indicator fitted in the usual way, will be found in the plates which accompany the report.

▲ ▲ ▲

Decimal Coinage Proposed for England.

An American who travels in Europe invariably experiences far more trouble with English coinage than with those of France, Belgium, Switzerland, Germany or Russia simply because the coinage of all the last named countries is upon the decimal system—*i. e.*, their units of value. The franc, the mark and the rouble are divided into 100 equal parts and mental calculations in comparing prices or in making change are as readily made as in our own money, while with the British money all is confusion worse confounded until one does much studying and has gained considerable experience. If the language were different from our own the difficulties would of course be far greater. They are beginning to see in England the disadvantage this puts them to in Continental trade, and of late many letters have appeared in the London press advocating that England adopt decimal coinage. To the fact that she has not this system is attributed one of the causes why her foreign trade has remained stationary in recent years, whereas great strides have been made by the United States and Germany. The story of an American banker in London, who, on having a note discounted, translated pounds, shillings and pence into dollars and cents, and computed the interest thus, and translated it back again before his English friend had got half through his tedious computation, may not be entirely without truth. England is forced to employ in foreign transactions the metrical system of weights and measures, and it is urged that a decimal coinage is a natural and indispensable supplement to it. London bankers and commission merchants warn the Government that British foreign trade will continue to decline until the absurd combination of the metric system and non-decimal coinage is remedied. It is quite that the question will be made the subject of debate in the House of Commons. As to the measures that the Government should adopt, the consensus of opinion seems to be that means should at once be taken to familiarize the British public with the metric system, and, secondly, that the British Chamber of Commerce should earnestly study the question how a decimal system of coinage could be introduced in place of the present antiquated system.

Advantages of the Metric System in Belgian Trade.

Our consuls located in Continental cities are not concerned very much about the intrinsic merits of the metric system, but some of them see that if we used it here we should be better prepared for handling foreign business. Mr. Morris, at Ghent, Belgium, for instance, writes: From the time of Washington to this day the evils of our system, or lack of system, have been pointed out. Probably if Great Britain had changed her system we would have done so. But it is time we went ahead and put ourselves in unison with the civilized world without waiting for Great Britain to lead us. In adopting the metric system for our weights and measures we would be doing what we did at the beginning for our money. It is on the same principle, and all the nations now using it found no difficulty in making the change. In one way or other Congress has given its approval of this system at different times, but has stopped short of making it compulsory.

The proposition advocated by Mr. Charles W. Stone, and which nearly passed the House in 1896, was to make it compulsory on the part of the Government in two years, and then two years later to make it the only legal system in the United States. Ignorance of the system, combined probably with some personal feeling, led to the defeat of the proposition at that time, but it should be taken up again by Congress at the first opportunity and put on the statute books.

▲ ▲ ▲

Commercial Review.

NEW YORK, SATURDAY EVENING Oct. 15, 1898.

DYNAMOS AND MOTORS.

The local situation this month is rather confusing. Some of the manufacturers' representatives in town who are not afraid to say that trade is good when it is good, and not infrequently have occasion to say so, are now complaining of dullness. For instance, one company, which does a considerable local trade in motors reports that there is less demand for them in New York now than at any time within a year. We are glad to say, however, that to offset this the orders that have lately drifted into some of the offices have been particularly good. In that connection the Bullock, Sprague and Crocker-Wheeler Companies may be mentioned.

The above remarks are without reference to the General Electric and Westinghouse-Walker interests. As to the Walker, in this district, we are informed that trade holds on well, although the adjustment of business with the Westinghouse Company rather confuses matters for the moment. There is a rumor that the Westinghouse Company has secured a big order for the power house equipment

of the Third Avenue surface road of this city, which is now one of the chief topics of interest among companies that make railway equipments; but a party claiming to be in a position to know emphatically denies to us that the contract has yet been awarded, and we have reason to believe that the Westinghouse Company's chief competitor has not yet relinquished efforts to secure it.

The business situation, as viewed from the standpoint of the General Electric Company, has almost the force of a market summary in itself, and it may not be waste of words to repeat the story of a man who spent some time last week at the Schenectady works. "September and the opening days of October," says he, "showed a large increase in sales of induced and direct current motors for factory purposes. There were also some large sales of motors for the sugar industry. Power transmission schemes continue to be prevalent. Several have come in sight recently. Incandescent lamp sales for this year will probably be 20 or 30 per cent. in excess of last year. Arc lamp sales also have been good, especially those of inclosed arc lamps. Among the later orders have been 200 direct current arc lamps for a large store in Allegheny, Pa., and 700 alternating current inclosed arc lamps for the Missouri Edison Company, St. Louis. Electric railway orders are very good. The seven big 5,000 horse-power three-phase machines for the Metropolitan Traction Company are approaching completion. The machinery for the Central London Underground Railway is fast being completed also. The station of the road in front of the Bank of England having been finished, it is probable that the apparatus will soon be required. Foreign trade continues good."

The "New Jersey Zinc Company of Pa." has placed an order for 1,800 kilowatts of generators, for lighting and power, and motors. The Crocker-Wheeler Electric Company was the fortunate recipient of the contract. Among other orders taken by the same electrical concern are a 45 kilowatt generator for the Crescent Watch Case Company's factory, Roseville, N. J., and some motors for the flour blending plant of Holt & Co. The Crocker-Wheeler Company is to install several hundred horse-power of dynamos in the Vincent Building, now going up at Broadway and Duane street, New York.

The Bullock Electric Manufacturing Company expects to move into its new plant in Cincinnati next month.

The English trade of the C & C Electric Company is holding on. The other day an order came also for a generator to go to Japan.

The Eddy Electric Company has received good orders this fall from California and Mexico.

Bids for a 1,000 incandescent light alternator and a 75 arc light generator for the town of Charlotte, near Rochester, N. Y., were to be opened to-day.

It is reported that "La Societa Italiana di Electtricita," organized in Turin, Italy, with a capital of $500,000, will soon require materials for an overhead trolley railway to be built between Oreglia and Ormea, and early next year will invest in several electric light plants.

The export shipments of electrical machinery from this country during the fiscal year ending June 30, 1898, reported by the Treasury Department were, as we have before stated in these columns, about $2,000,000. Now the foreign sales of electrical apparatus, largely machinery, made by one company during the year 1897, amounted, it is stated, to $3,000,000, and a report was afloat this summer that a certain concern, perhaps the same one, had $4,000,000 worth of foreign orders for various sorts of electrical goods on its books. Allowance must be made for the fact that the chief item in the $3,000,000 sales aforesaid was machinery that has not yet been shipped, and consequently has not yet found its way into the export statistics, and perhaps others among the exceptionally large sales of '97 were neglected in the official reports for a similar reason. Yet one cannot but wonder whether a great deal that is actually shipped is not omitted or wrongly classified. We are told by an official of one company that several years ago he used to label cases of car controllers as railway switches, because the duty on railway switches—that is such as are laid down in the street—was less than upon controllers. After a while he was found out, and called to account, upon which he replied innocently that "switches" he understood as the mechanism for turning on and off the current—a proposition very hard to refute. We have strong reason to believe that the day of resort to such contrivances has not yet gone by.

MISCELLANEOUS.

Chinese trade reports for 1897 received by the United States Treasury Department show that Chinese imports from America continue to increase, while those from other countries are decreasing. This fact is of exceeding moment, because of its influence upon the future American policy in the Far East.

Consul J. G. Stowe, of Cape Town, states that there is prospect for an increased field for American windmills in South Africa, as the various systems of irrigation are established.

Mr. Robert P. Porter, who was appointed by President McKinley a special commissioner to investigate the economic conditions of Cuba and has recently returned, says: "The great drawback to Cuba now, as in the past, is its unjust customs duties. Everybody is taxed, heavily taxed. * * * The Spaniards have killed the goose that laid the golden egg by the frightful tariff put on everything. An increase of 20 per cent. was bad enough, but when 10 per cent. was added to this the tariff simply became unbearable. The merchants are holding tons of stuff where duty will not affect them, and everything in consequence is at a standstill. There are millions of dollars ready to go there, but everybody is waiting until lower duties arrive. The sentiment to get rid of the Spaniard as soon as possible is growing stronger day by day in Cuba. This restlessness and sentiment are particularly noticeable among the members of the Chamber of Commerce and the Board of Trade of Havana."

South African advices to a local engineering concern state that orders for material for extension of the Johannesburg lighting plant are to be placed, and American, as well as English and German, proposals will be considered. The equipment will include a carburretted water-gas plant, two sets of 300 kilowatt three-phase generators, with compound condensing engines and boilers of 600 horse-power; two direct-coupled exciters of 30 kilowatts each, condensing plant and other accessories. A loan of $750,000 is being raised by the Town Council to pay for the plant. In South Africa, also, some good sized orders are expected to be given out for mining plants. A battery of seven new Babcock & Wilcox boilers has been ordered for the De Beers mines, Kimberley, and the new Modderfontein Company has contracted for an engine of 1,000 horse-power. This will be the largest engine in the Transvaal, it is affirmed.

Dove-tailing machinery is wanted in Nantes, France. Consul Brittain writes: "One of the leading business men of Nantes informs me that certain American wood-working machines used in dovetailing lumber for packing cases would find a market here. The gentleman was unable to give the name of the manufacturer, or the exact name of the machine, but said he saw them working in England and that they did their work neatly and rapidly. An immense amount of lumber is constantly used here in making the cases in which small sardine boxes and packages of conserves are packed for shipment. Not only could the machine be used in Nantes in dove-tailing lumber for boxes, but also at Brest, Lorient and Concarneau, where other large sardine factories are located, and at Samur, where quantities of fine wines are packed for shipment. Thousands of cases are also used by the extensive biscuit factories of Nantes. American manufacturers wishing to place the machines on the market in this part of France will do well by corresponding with Mr. Edward Kerr, 3 rue Gresset, Nantes."

CHICAGO MACHINERY REPORT.

Large manufacturers of dynamos and generators still find in the development of the electric railway their best market.

Larger and more numerous sales are made with the steel railway men than any other or than all other classes of buyers. The extension of electric lines seems to be central just now in Northern Ohio, in Indiana, and in Southern Michigan, where there are quite a number of enterprises of this kind both under way and in contemplation. Installations at manufacturing plants, however, are not uncommon. Recently the Crocker-Wheeler Company secured the contract for equipping the new shops of the Chicago Great Western Railway, at Oelwein, Ia., with electrical motive power, consisting of three 100 kilowatt generators and twenty-one motors, aggregating from 550 to 600 horse-power. Compared with some of the street railway equipments this is not a large power, but the order is somewhat notable from the fact that the entire power of the shops will be derived from this source, and that it will be the first railway shop in the West to be completely fitted with electrical power.

The general market for electrical goods may be described as active. Almost without exception manufacturers are slowly but steadily gaining in their output. Some are gaining rapidly. It is remarked also that manufacturers of rheostats and other accessories to an electrical power outfit are busy, and in not a few instances are unable to supply as fast as wanted their goods to the motor manufacturers.

The representative of a large tool manufacturer in Southwestern Ohio says that during the past week they have been turning away considerable work, for the reason that they could not make the deliveries desired. Comparatively few new plants are in the market for tools, the bulk of the orders current coming from large manufacturers who are enlarging their plants.

Crude iron and steel in the West continue active and steady. A 5 per cent. advance in cold rolled shafting is reported. But for product generally there is no change in values. New demand is only moderate, but mills are crowded with old obligations, and are not looking very eagerly for new trade. Car works are said to be filled with orders, with possibly one exception, requiring their entire output up to about March 1.

The Siemens & Halske Electric Company is not quite so busy as it was a month ago, when it had a considerable number of rush orders on hand, but it is running twice as many men as at this time two years ago. Inquiries with the company are good and improving.

CINCINNATI REPORT.

In lines of machinery, such as machine tools and engines, in electrical machinery and supplies, while here and there a manufacturer may not have had as many new orders as in previous months, September business as a whole was of good volume. Some of the manufacturers of machine tools had, at the first of September, enough orders on their books to keep them busy for the rest of the year, even had they taken no more. The markets for engines and electric lighting and street railway outfits and other machinery enjoyed in some measure the same conditions as machine tools. A large proportion of the business done here continues to be for foreign account, as it has been in the past, though it is true that the war affected our trade with Spanish-American countries.

Although sales this year and last have been so largely for foreign shipment there has been a growing increase in domestic trade, showing radical improvements in many cases. The Cincinnati correspondent of the "American Machinist" has interviewed a great many of the manufacturers of that city or their representatives and is able to give the following reports:

The American Tool Works Company has been experiencing a better trade this year than last, and still better than the year before. It has some 600 men employed, and orders enough to keep them very busy for four months to come. Foreign orders now on hand include those from St. Petersburg, Warsaw, Düsseldorf and London. A 60x24 lathe has been shipped to the Mathiesen & Hegler Zinc Company, La Salle, Ind.

The Lodge & Shipley Machine Tool Company's trade this year, which has been excellent, has consisted of nearly 40 per cent. of foreign orders. Domestic business has been better than in some previous years, and will by the end of this year, it is thought, greatly excel that of '97.

Dietz, Schumacher & Boye have seen an increase of home trade this year over last year, amounting to about 50 per cent. Their orders are about equally distributed between domestic and foreign, and there are enough now on hand to occupy the firm fully for the rest of the year.

Dreses, Mueller & Co. have occupied the new addition to their building on Buck street. Business is good, the greater part of it foreign, but better in home orders than last year, and is sufficient, all told, to keep them at work for several months on present contracts.

The A. Streit Machine Company continues to have a very fair trade. Aside from one large contract now on hand they are having fair orders for their boring machines and emery grinding machines.

Rahn & Mayer did a large September business, and their trade from the first of the year to the end of that month was 50 per cent. ahead of that of a year ago. The first week of this month was quiet, but they had many unfilled orders on their books, and the second week brought several good ones.

Louis C. Rechtin & Brother note improvement in their trade during a few weeks past. For the year up to the beginning of this month an increase of more than 30 per cent. over the corresponding portion of 1897 was observed.

Here are some reports in the woodworking machinery line: The J. A. Fay & Egan Company notes a steady increase in business, which, for the months of this year preceding October, has been more than double that for the corresponding period in 1897. This improvement has included a notable increase in home trade, which is well distributed. A number of new factories requiring woodworking machinery are starting up in various places. The works of the company are now operated with an increased force, and are expected by the first of the coming year to be running overtime. The Cordesman Machine Company reports trade very fair.

In the steam power line the following reports may be cited: The I. & E. Greenwald Company, while not having any large contracts on hand at present, is quite busy filling orders for engines of from 75 to 200 horse-power. There is a good demand for engine and machinery connections. Mr. P. B. Bird, Cincinnati agent of the Turner Engineering Company, of Bucyrus, Ohio, has closed a contract for a 1,000 horse-power water tube boiler. The Snow Steam Pump Company has secured several orders in this market lately for boiler feed pumps. The works of the company are running in part overtime. Its export business, as well as its home trade, is good.

In the way of erecting large buildings not very much has been done in Cincinnati of late, but some new manufacturing plants have been put up, and some additions to old ones. In fact, there has been a little boom this year in the construction of new shops for the tool makers. The Stewart Architectural Iron Company reports a number of contracts from various sections of the country. They comprise among others a considerable number of jail building contracts, chiefly in the South, viz.: one at Charlottesville, Va.; two in Kansas, three in Georgia, two in Alabama and one in Oklahoma; besides work upon the Illinois State Reformatory, Pontiac, Ill.

Some improvement is noticed in brass, iron, etc., for manufacturers' supply.

The Oesterlein Machine Company is a new concern incorporated under the laws of Ohio, capital, $30,000, which has succeeded W. Oesterlein. The company is doing a good business.

▲ ▲ ▲

Quotations.

NEW YORK, Monday, October 17.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 25 @ 11 50
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 50 @ 10 75
Gray forge, Northern	10 00 @ 10 25
No. 1 foundry, Southern	11 25 @ 11 50

(*Quotations continued on page 40.*)

(*Quotations continued from page 39.*)

No. 2 foundry, Southern..... 11 00 @ 11 25
No. 3 foundry, Southern..... 10 75 @ 11 00
No. 1 soft, Southern..... 11 25 @ 11 50
No. 2 soft, Southern..... 10 75 @ 11 00
Foundry forge, Southern..... 10 00 @ 10 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.05 @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.30 @ 1.35c.; refined, 1.35 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @ 7c., with lower prices on some brands; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.45 @ 1.50c.

Cold Rolled Steel Shafting—Base sizes, from store, 2.20 @ 2.25c., according to quantity.

Copper—Carload lots, Lake Superior ingot, 12½c.; electrolytic, 12¼ @ 12⅜c.; casting copper, 12 @ 12⅛c., for ordinary brands.

Pig Lead—Carload lots, 3.85c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 17¾ @ 18c., f. o. b.

Spelter—Carload lots, 5.00c., New York delivery for ordinary brands.

Antimony—In cask lots: Cookson's, 9½c.; Hallett's and French E. B., 8⅞ @ 9c.; Japanese, 8⅝ @ 8⅞c.; United States, 8.70 @ 8.75c.

Lard Oil—Prime city, ice pressed, 44 @ 46c., in wholesale lots.

▲ ▲ ▲

Manufacturers.

The Johnson Forge Company, of Wilmington, Del., will build an additon 60x230 feet to its plant.

A 50 foot addition is to be built to the picking department of the Barker Mill, in New Auburn, Me.

A. R. Kerr &Co. have begun to put up the iron work for Wetherell & Co.'s new foundry, Chester, Pa., on the Seventh street side.

Work has been commenced on the new rolling mill for Peck, Benny & Co., Montreal, Canada, on the site of the old mill, which was burned down recently.

The Lanham Bannister & Column Company, of Mansfield, Ohio, has decided to remove its establishment to St. Albans, and will begin the erection of the new buildings soon.

The American Lamp Chimney Company, a new organization, is to erect at Toledo, Ohio, a factory. I. D. Libbey is president of the organization, and the capital stock is $750,000.

Building Inspector Heller recently received an application from the Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, for a permit to build a two-story brick shop, to cost $20,000.

The new mill of the Dwight Manufacturing Company, Gadsden, Ala., is to be erected by themselves, no contract submitted being satisfactory. A large force of men are at work excavating.

The American Air Power Company will erect a one and two story brick power house, 50.7x103x90.2, on the east side of Thirteenth avenue, south of Ninety-fourth street, New York city, at a cost of $20,000.

A company to succeed T. D. Keasey has been organized with sufficient capital, under the name of the Keasey Pulley Company, at Toledo, Ohio. The management of the company will still remain with Mr. T. D. Keasey.

The plans of the buildings proper of the United States Glue Company, of Carrolville, Milwaukee, have been completed, and their cost will be $110,000. About $100,000 will be spent for machinery. The plant is to consist of seven buildings, all of brick. They will be of slow-burning construction, part iron and part composition. The boiler and engine room and sulphur house will be 250x205 feet. The power house, 45x160 feet, will contain 1,000 horse-power water boilers with automatic conveyers for coal and ashes. There will also be a one-story car-

Business Specials.

Gear wheels, gear cutting. Grant; see page 18.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Send for my water tube boiler catalog. E. P. Watson, Elizabeth, N. J.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

A manufacturing concern having large shops with modern tools, foundry, pattern shop, etc., is desirous of adding to its present line, and wishes to negotiate with parties wanting mach'y. built. Box 36, Am. Ma.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Draftsman and machinist; boilers, engines and general machinery. Box 27, care of American Machinist.

Draftsman, five years' experience; watch machine, bench machine and small work. Box 31, Am. Mach.

Mechanical draftsman desires to change; 7 years' shop and office experience. Box 34, Am. Machinist.

Situation wanted by financial manager; thorough acc't; age 40; married; first-class refs. Box 40, Am. Ma.

Up-to date machine shop foreman wants position; good manager of men. Box 45, American Machinist.

Toolmaker experienced on jigs, cutters and fine special machinery; have had charge. Box 42, American Machinist.

A first-class machinist, with some college training, wants a position as instructor in a college machine shop. Box 47, American Machinist.

Wanted—Position as brass foundry foreman; thoroughly experienced in all the details, and a hustler. Address Box 41, American Machinist.

Situation wanted by draftsman to take charge of steam and electric plant, and design special machinery. Address Box 44, American Machinist.

Frenchman speaking German and English, experience as salesman in France in tool and machine tool business, wants position. Box 46, Am. Machinist.

First-class toolmaker used to gun, sewing machine and bicycle tools, etc., desires position; best of references from last employers. Box 48, Am. Machinist.

A competent draftsman, experienced in designing special and intricate machinery, desires steady position in New York or Brooklyn. Box 49, Am. Mach.

Wanted—Position as foreman or superintendent in machine shop; fully competent to design machinery and special tools for all manufacturing purpose; exp. in handling men; best of references furnished. Address No. 177 Langley road, Newton Centre, Mass.

Help Wanted.

Wanted—Competent draftsmen for heavy automatic machinery. Address Paymaster's Dept., The Yale & Towne Mfg. Co., Stamford, Conn.

Wanted—At once, skilled draftsmen and designers who are familiar with pumping machinery or Corliss engines. Box 43, American Machinist.

Wanted at once a first-class traveling man for an Ohio supply house to travel in Ohio and Indiana. Address Supply, care American Machinist, New York City.

A few additional apprentices will be received by R. Hoe & Co., printing press mfrs., to learn the machinist's trade in its various branches; attendance at firm's evening school three even'gs each week is exp'd. Apply pers'ly or by letter R. Hoe & Co., 504 Grand St., N. Y.

Wanted—Hartford automatic screw machine operator; single German preferred; to the right party an unexceptional opportunity for starting up a new plant in Germany and securing position as salesman afterward. Address Box 39, American Machinist.

Wanted—A progressive Western concern, employing 350 men, manufacturing agricultural implements, wants an up to-date, industrious young man as gen. foreman or assistant supt; must have had exp. in this line and understand the handling of men; none but capable, exp. men need apply; a permanent pos. for the right man. Address, giving age, experience and salary expected, Box 35, care of American Machinist.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Philadelphia Book Co., Phila., Pa., catalog free.

Caliper catalog free. E. G. Smith, Columbia, Pa.

Book, Dies & Die Making, $1. J. L. Lucas, Prov., R. I.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

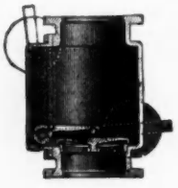
Cone Pulleys! Can you design cone pulleys? Send for pamphlet; new method; simple rules for all cases. 50 cents. W. K. Palmer, Lawrence, Kansas.

Institutions retiring from business having machine tools, brass or wood working machinery, will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach Co., 55-59 Woodbridge st., W., Detroit, Mich.

A. Pieper,

Nessonvaux, Belgium,

is desirous of receiving catalogues from American manufacturers interested in the bicycle industry.



Excelsior Straight-Way Back Pressure Valve. This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

JENKINS BROTHERS, New York, Boston, Philadelphia, Chicago.

A HAND-BOOK OF ENGINEERING LABORATORY PRACTICE.

By RICHARD ADDISON SMART, M. E., Associate Professor of Experimental Engineering, Purdue University.

viii.+290 Pages, 12mo, Cloth, $2.50. *Order through your bookseller, or copies will be forwarded postpaid by the publishers on the receipt of the retail price.*

JOHN WILEY & SONS, 53 East 10th Street, New York City.

FINEST QUALITY OF REAMERS.

Patent Spiral Flutes, "LIGHTNING AND GREEN RIVER" SCREW PLATES,

Taps, Dies, etc.

Send for Catalogue.

WILEY & RUSSELL MFG. CO., Greenfield, Mass., U. S. A.

Agents in London: SELIG, SONNENTHAL & CO., 85 Queen Victoria Street.

We Make **Boring Machines, Milling Machines, Special Tools** BEAMAN & SMITH, PROVIDENCE, R. I.

penter and blacksmith shop, 60x120 feet. The machinery and lighting throughout will be furnished by electricity.

Geo. W. Sykes, of Reynoldsville, Pa., and Levi Heidrick, of Brookville, Pa., will erect a woolen mill at a cost of $50,000.

D'Amour & Littledale have moved from 204 East Forty-third street to the corner of Worth and Centre streets, New York.

Architect William A. Chapin, of Grand Rapids, Mich., has prepared plans for a two-story brick factory, 70x107 feet in size, for the Eaton Rapids Woolen Mills, to cost $11,000.

William Flemming, of Philadelphia, Pa., has secured the contract for the addition to the factory building of Messrs. Taylor Brothers, of Germantown, Pa.

At Sayleswille, R. I., Frank A. Sayles is making considerable improvements to his plant. It is stated that he contemplates erecting another mill adjoining the present one.

Cope & Co. have awarded the contract to J. D. Caldwell to erect an additional story, 42x77 feet, to their plant on the west side of Wayne street, north of the Philadelphia and Reading Railway, Wayne Junction, Pa.

The carpenter and wheelwright shops at the Shenandoah City Colliery, Shenandoah, Pa., operated by the Philadelphia & Reading Coal & Iron Company, were recently destroyed by fire, with all machinery, tools and other contents.

The Dumburton Flax Spinning Company, Greenwich, N. Y., is arranging to enlarge its plant. It will build a new mill in its present plant, 50 feet by 70 feet, with a capacity to employ forty new hands of skilled laborers.

The Berlin Iron Bridge Company, of East Berlin, Conn., is erecting the extension of the foundry for the Benjamin Atha & Illingworth Company at Harrison, N. J. This extension is 51 feet wide and 152 feet long. The framework is of steel throughout.

The Messenger-Hall Manufacturing Company has been organized at Portland, Me., for the purpose of the manufacture and sale of machinery, with $100,000. The officers are: President, Edward H. Lounsbury, of Woburn, Mass.; treasurer, Leander W. Hall, of Woburn, Mass.

The Federal Manufacturing Company has been organized at Portland, Me., for the purpose of the manufacture and sale of gas appliances, with $100,000 capital stock. The officers are: President, George M. Butterick, of Boston, Mass.; treasurer, Freeman Emmons, of Wakefield, Mass.

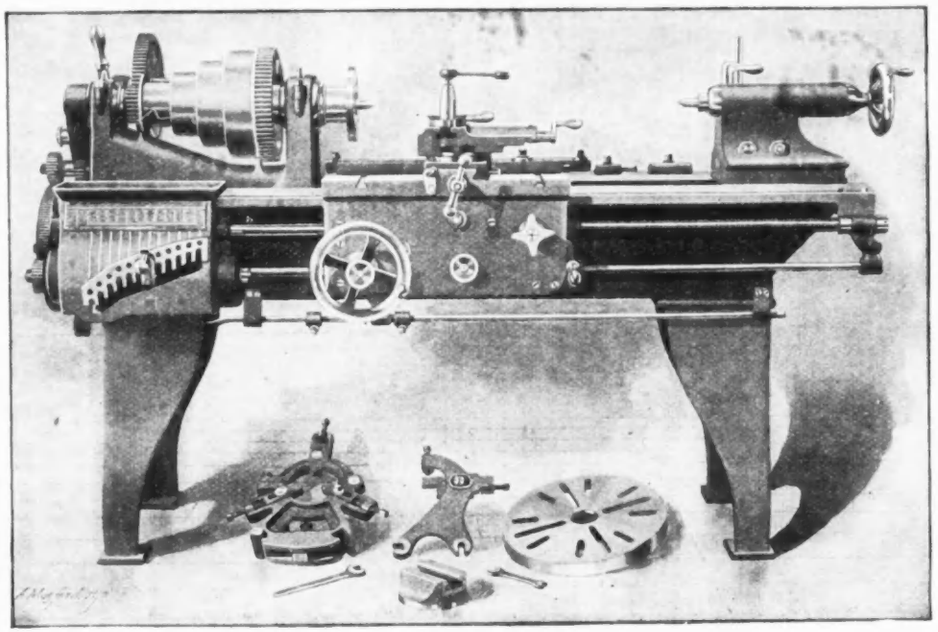
The Peerless Portland Cement Works, Union City, Mich., were badly crippled by fire recently, entailing a loss of about $40,000, with no insurance. The officers of the company are: J. E. Saxton, president, and Lee K. Forsythe, secretary and treasurer, both of Union City, and Robert M. Wood, of Chicago, vice-president.

Crane & Barkhausen are preparing plans for a factory building at Clinton and Florida streets, Milwaukee, Wis., for the Western Chemican & Manufacturing Company. It will cost about $60,000 and will be ready for occupancy in February, 1899. The building will be of solid stone and brick, 120x128 feet, and five stories high.

The annual meeting of the stockholders of the Bangor Electric Clock Company was held recently, when the following officers were elected: President and general manager, Joseph S. Smith; vice-president, Samuel R. Prentiss; superintendent, Walter J. Dudley. It is expected that work will be begun in the factory before the end of the year, as the new factory is nearly completed.

Plans have been made at the Bath (Me.) Iron Works for an addition to the present machine shop. The new building will be of brick and steel, and extend from the present shop, covering the ground now occupied by the office, nearly to the street. It will be 129 feet in length and 100 feet in width. Later it will be extended so as to cover to ground now occupied by the old machine shop and will ultimately be 310 feet in

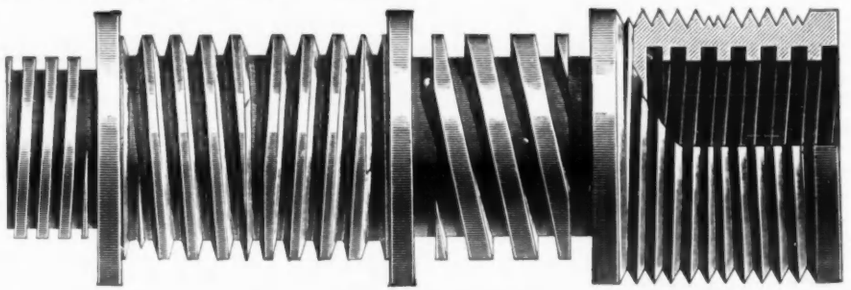
16 in. x 6 ft. Hendey-Norton Lathe.



THE HENDEY-NORTON ENGINE LATHE is the most modern type of engine lathe extant. Why? Because it has the best improved attachments known for the rapid and accurate production of high-class lathe work in use on engine lathes at the present time.

One is the Norton arrangement of change gears for screw cutting. All the change gears are mounted in the gear box ready for use. The different pitches are obtained by the simple movement of handle in gear box from one notch to the other, carrying with it an intermediate gear meshing into the cone of change gears. Thus every thread required in ordinary use is obtained on the instant, and this applies equally well to the feeds.

Another is the reversing lever at side of apron. At the moment of changing travel of carriage, as when cutting threads, you have but to move up or down this lever when the *carriage*—not the countershaft, belt, head spindle and work—returns in the opposite direction, and so on till work is finished. This saves wear and tear on working parts.



In this specimen of thread cutting we have a good illustration of the application of the above features; but it is here shown to illustrate in particular what our Automatic Stop will do. It shows how threads can be cut to and from shoulders, both internally and externally, tool stopping to a certainty, and with work in motion. This feature is equally applicable in turning work in duplicate. The Automatic Stop is at once positive and simple.

The Hendey Machine Co.,

Torrington, Conn.

AGENTS FOR THE PACIFIC COAST:
Pacific Tool & Supply Co., San Francisco, Cal.

J. W. Cregar, Philadelphia Bourse Exhibition.

EUROPEAN AGENTS:
Schuchardt & Schutte, Berlin, Vienna, Brussels.
Chas. Churchill & Co., Ltd., London and Birmingham, Eng.
Adolphe Janssens, Paris, France.

length. It will be a modern fireproof building in every respect.

The Keystone Spoke & Bending Works, Hanover, Pa., were recently destroyed by fire.

The Milwaukee office of Wickes Brothers has been removed to the Marquette Building, Chicago.

The Pollard Manufacturing Company, of Bellows Falls, Vt., is to erect an addition to its plant.

Chase Brothers, Littleton, N. H., have commenced to rebuild their saw mill that was burned last July.

An addition is being made to the factory of John Adt & Son, New Haven, Conn., of which F. B. Shuster is the proprietor. The plans have been prepared by Architects Brown and Von Beeren, and the improvements will comprise a new factory 40x100 feet, with two stories and a basement, which will be erected on Mill River street. Then there will be a three story engine room with dimensions of 15x20 feet, and boiler room 30 feet in height. The cost of the above named improvements will be in the neighborhood of $9,000.

Bids will be received soon by the newly incorporated Alcania Tin & Terne Company of Pennsylvania for the erection of two of the six mills which it has decided to build at Avonmore, Pa. Designs for the new plant have already been prepared by S. Diescher, of Pittsburg, and were last week approved by the directors of the new company, who are: W. H. Hilliard, Oliver Wylie, A. O. Fording, W. S. Collier and M. M. Garland. It is the present intention of the new tin plate company to build two mills immediately, and when those two are running satisfactorily to add the other four mills, one at a time.

▲ ▲ ▲

New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

We have received from the John Thomson Press Company, New York, catalog of platen presses for embossing, cover stamping, paper box cutting and scoring. Views of the different presses are shown, together with very full descriptions. The catalog is standard size, 6x9 inches.

We have received from C. W. Hunt Company, of New York, Catalog No. 9,805, in which are described and illustrated industrial railways for manufacturing establishments. The standard gage of these railways is 21½ inches, and in a great many establishments which cover a considerable area one can see how much saving is effected by the use of such a railway. Cars for use on these railways, which are manufactured by the same company, are described. Track plans of a number of plants where these railways are in use, also pictures of a large variety of special cars for same, are shown. The catalog is 6½x9¼ inches.

From the same company we have received catalogs Nos. 9,807 and 9,811, the first of which describes and illustrates mast fittings, coal tubes and other contrivances employed in the lifting of coal. The other catalog is devoted to the description of Manila rope. Some interesting reading regarding the characteristics of this rope is given in the catalog, together with a number of illustrations, showing the processes through which it passes before use. The catalog contains reprint of a paper on rope driving, read by Mr. C. W. Hunt before the meeting of the A. S. M. E. in 1891, also reproductions of articles on the subject from "Engineering" and "Engineering News." Both catalogs are 6½x 9 inches, and to those interested in the subjects with which they deal should prove highly interesting.

The CROSS OIL FILTER

actually reduces oil bills 50% or more. Sent on approval. Capacities 3 to 120 gals. per day. Used in 18 countries. Testimonials from the leading firms in every field of industry.

THE BURT MFG. CO.
AKRON, OHIO, U. S. A.

Business Established 8 Years.

Largest Manufacturers of Oil Filters in the World.

Armstrong's Pipe Threading and Cutting-off Machines.

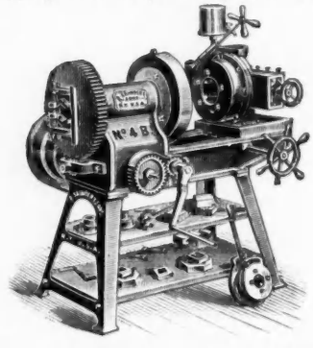
No. O Machine.

Both Hand and Power.
Sizes 1-8 to 6 in.
Our Stocks and Dies universally acknowledged to be THE BEST.
Send for Catalog.

The Armstrong Mfg. Co.,
Bridgeport, Conn.
139 Centre St., New York.

D. SAUNDERS' SONS,

MANUFACTURERS OF
Pipe Cutting and Threading Machines
Steam and Gas Fitters' Hand Tools,
Tapping Machinery for Pipe Work, Etc.

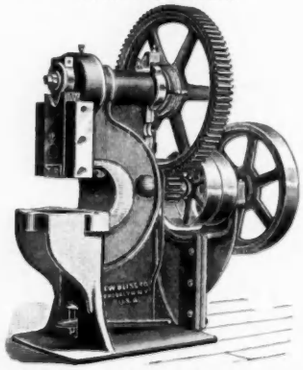


The No. 4 B Machine for Cutting and Threading Pipe ⅛ to 4 in., by HAND or POWER.

Send for Catalogue to
21 Atherton Street, YONKERS, N. Y.

E. W. BLISS CO.

1 Adams St., Brooklyn, N. Y.
CHICAGO: 96 W. WASHINGTON ST.
European Office:
12 Ave. de la Grande Armée, Paris, France—
A. WILZIN, Manager.



No. 4 Stiles Geared Power Punching Press.

Owners of the Stiles & Parker Press Company.

Presses, Dies, Shears and Special Machinery.

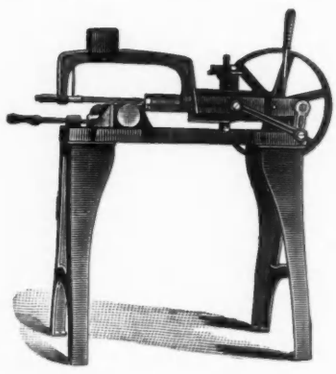
Manufacturers of the WALDRON FRICTION CLUTCHES.

"The best is as good as any."

The New

Automatic and Gravity Feed

Q & C Shop Saw

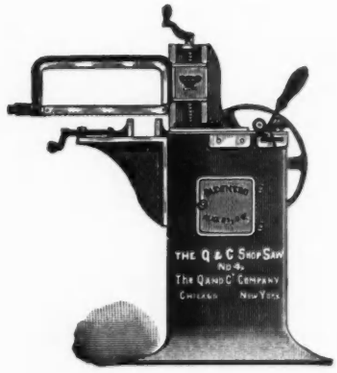


Cuts { Tool Steel, Machinery Steel, Iron, Brass and All Other Metals.

Price—'Way Down.
Quality—'Way up.

Shop Saws,
Portable Rail Saws,
Cold Power Saws,

For All Purposes.



Send for Catalogue.

Q & C Company,

Chicago. New York.

LONDON: Chas. Churchill & Co.
PARIS: Hounsfield & Fils.
BERLIN: Schuchardt & Schutte.
MADRID: J. G. Neville & Co.

Index to Advertisers.

	PAGE
Acme Machinery Co.	18
Albro-Clem Elevator Co.	10
Almond, T. R.	46
Alteneder & Sons, Theo.	48
American Gas Furnace Co.	2
American Tool & Machine Co.	2
American Tool Works Co.	15
American Turret Lathe Works Co.	48
Armstrong Bros. Tool Co.	51
Armstrong Mfg. Co.	50
Atha & Illingworth Co., Benj.	14
Backus Water Motor Co.	43
Baird & Co., Henry Carey	47
Baird Machinery Co., U.	13
Baldwin, Davidson & Wight	8
Ball Bearing Co.	18
Barnes & Co., W. F. & John	8
Bartlett, Edward E.	14
Beaman & Smith	40
Bement, Miles & Co.	2
Berlin Iron Bridge Co.	51
Besly & Co., Chas. H.	52
Bethlehem Foundry & Machine Co.	46
Betts Machine Co.	5
Bickford Drill & Tool Co.	48
Bignall & Keeler Mfg. Co.	43
Bilgram, Hugo	48
Billings, Spencer & Co.	9
Blaisdell & Co., P.	48
Bliss Co., E. W.	46
Boston Gear Works	43
Bowsher Co., N. P.	47
Bradford Belting Co.	4
Bradford Mill Co., The	45
Bradley Co., The	14
Bristol Co.	52
Brown & Co., R. H.	3
Brown & Sharpe Mfg. Co.	52
Buckeye Engine Co.	51
Buffalo Forge Co.	52
Builders' Iron Foundry	8
Bullard Machine Tool Co.	14
Bullock Electric & Mfg. Co.	16
Burt Mfg. Co.	40
Carborundum Co., The	10
Card Mfg. Co., S. W.	4
Case Mfg. Co.	49
Chambersburg Engineering Co.	50
C & C Electric Co.	8
Cincinnati Milling Machine Co.	44
Cleveland Machine Screw Co.	4
Cleveland Stone Co.	47
Cleveland Twist Drill Co.	52
Clough, R. M.	3 and 48
Cook Co., Asa S.	3
Crescent Steel Co.	10
Curtis & Co. Mfg. Co.	43
Curtis & Curtis	4
Cushman Chuck Co.	3
Dallett & Co., Thos. H.	14
Davis Machine Co., W. P.	18
Dayton Globe Iron Works Co.	50
Detrick & Harvey Machine Co.	48
Diamond Machine Co.	16
Dixon Crucible Co., Joseph	45 and 49
Doan & Co., J. B.	13
Draper Machine Tool Co.	7
Dreses, Mueller & Co.	46
Eames Co., G. T.	49
Errington, F. A.	3
Evans Friction Cone Co.	3
Faneuil Watch Tool Co.	51
Farquhar Co., A. B.	50
Fay & Scott	49
Ferracute Machine Co.	47
Fellows Gear Shaper Co.	10
Fifield Tool Co.	52
Flather & Co.	18
Foos Gas Engine Co.	50
Foote, Burt & Co.	46
Forbes & Co., W. D.	50
Fox Machine Co.	18
Frick Co.	50
Fuel Economizer Co.	10
Gang & Co., Wm. E.	51
Garvin Machine Co., The	14
General Electric Co.	17
Geometric Drill Co.	3
Gisholt Machine Co.	44
Gleason Tool Co.	18
Goodyear, S. W.	4
Gould & Eberhardt	18
Grand Rapids Gas Engine & Boat Co.	50
Grant Gear Works	18
Gray Co., G. A.	18
Haeseler & Co., C. H.	4
Hampden Corundum Wheel Co.	3
Hartford Steam Boiler Insp. & Ins. Co.	17
Henderer's Sons, A. L.	2
Hendey Machine Co.	41
Hilles & Jones Co.	51
Hobson, Seaman & Co.	14
Hoggson & Pettis Mfg. Co.	3
Hoppes Mfg. Co.	48
Horton & Son Co., E.	3
Hunt Co., C. W.	4
Hurlbut-Rogers Machine Co.	3
Hyatt Roller Bearing Co.	2
Ingersoll-Sergeant Drill Co.	8
International Correspondence Schools	12
Jenkins Brothers	40
Jessop & Sons, Wm.	48
Jones & Co., B. M.	48
Jones & Lamson Machine Co.	1 and 18
Kelley Machine Co., R. A.	4
Kempsmith Machine Tool Co.	49
Keuffel & Esser Co.	49
Keystone Drop Forge Co.	8
Keystone Electric Co.	45
Landis Tool Co.	45
Le Blond, R. K.	52
Le Count, Wm. G.	3
Lodge & Shipley Machine Tool Co.	13 and 44
Long & Alstatter Co.	46
Lucas & Gliem	18
Maschinenfabrik Grevenbroich	49
Maris Brothers	9
Marshall & Huschart Machinery Co.	13
McCabe, J. J.	13
Mergenthaler & Co., Ott	6
Merrell Mfg. Co.	9
Meyer, Hugo Herman	13
Mianus Electric Co.	50
Mietz & Weiss	50
Mitts & Merrill	51
Moline Elevator Co.	4
Monarch Mfg. Co.	50
Montgomery & Co.	40
Morse Twist Drill & Machine Co.	17
Morse, Williams & Co.	51
Morton Mfg. Co.	49
Mossberg & Granville Mfg. Co.	42
Mosse, Rudolf	9
New Era Iron Works	50
New Haven Mfg. Co.	4
New Process Twist Drill Co.	8
Newton Machine Tool Works, Inc.	10
Nicholson File Co.	10
Niles Tool Works Co.	15
Niles Tool Works Co., New York Branch	13
Norton Emery Wheel Co.	47
Oesterlein Machine Co., The	18
Oster Mfg. Co.	51
Otto Gas Engine Works	50
Page's Sons, Isaiah	4
Pearson Machine Co.	52
Philadelphia Book Co.	8
Pond Machine Tool Co.	7
Poole & Son Co., Robt.	48
Pope Tube Co.	5
Powell Planer Co.	48
Pratt & Whitney Co.	47
Pratt Chuck Co.	3
Prentiss Tool & Supply Co.	13
Q & C Co.	42
Rahn & Mayer	10
Rand Drill Co.	50
Reed Co., F. E.	43
Reeves Pulley Co.	8
Reinecker, J. E.	49
Rogers Boat, Gage & Drill Works, John	6
Rue Mfg. Co.	50
Sackman, F. A.	17
Safety Emery Wheel Co.	40
Saunders' Sons, D.	46
Sebastian Lathe Co.	17
Sellers & Co., Inc., Wm.	18
Seneca Falls Mfg. Co.	47
Shultz Belting Co.	18
Sibley & Ware	2
Skinner Chuck Co.	3
Slocomb & Co., J. T.	10
Smith & Mills	47
Spencer Auto. Machine Screw Co.	49
Springfield Gas Engine Co.	50
Springfield Machine Tool Co.	17
Standard Tool Co.	52
Starrett Co., L. S.	8
Steel Ball Co.	43
Stevens Arms & Tool Co., J.	17
Stiles Press Co., E. S.	4
Stover Novelty Works	10
Stow Flexible Shaft Co.	48
Stuart's Foundry & Machine Works, R. J.	52
Sturtevant Co., B. F.	9
Tabor Mfg. Co.	4
Tight Joint Co.	3
Timolat, J. G.	47
Toledo Machine & Tool Co.	3
Toomey, Frank	13
Trump Bros. Machine Tool Co.	3
Turner, Vaughn & Taylor Co.	43
T. & B. Tool Co.	18
Walker, O. S.	52
Warner & Swasey	52
Watkins Co., F. M.	50
Watson-Stillman Co., The	9
Webb Hinge Belt Hook Co.	10
Weber Gas & Gasoline Engine Co.	50
Webster Co., Warren	50
Webster Mfg. Co.	50
Webster & Perks Tool Co.	8
Wells Bros. & Co.	14
Westinghouse Electric & Mfg. Co.	15
Whitcomb Mfg. Co.	10
Whitney, Baxter D.	46
Whitney Mfg. Co.	46
Whiton Machine Co., D. E.	3
Wiley & Sons, John	40
Wiley & Russell Mfg. Co.	40
Williams & Co., J. H.	9
Winkley, F. D.	4
Woodward & Rogers	4
Worcester Machine Screw Co.	8
Wossidlo & Co.	48
Wyke & Co., J.	43
Wyman & Gordon	52
Young Mfg. Co., W. C.	4

▲ ▲ ▲

Contents.

	PAGE.
The Hydraulic Service Engine of the Pope Tube Company—II.	19
The Rotation of the Earth and the Side Pressure of the Locomotive.	21
The Card Index System of Filing Notes and Clippings. By F. A. Halsey.	23
A Helical Milling Attachment.	25
Cost of Electric Power.	26
Machine Tools for Indian Artisans.	26
True Fuel Economy of Locomotives. By Robert Quayle.	28
The White Star Liner Oceanic.	29
An Unappreciated Draftsman.	29
Letters from Practical Men: Universally Incorrect Indicator Practice. By Walter Ferris....Incorrect Indicator Practice. By Tecumseh Swift....A Ball Milling Job—A Tool Steel Experience. By W. A. Warman....An Improvised Power Driven Hack-Saw—Applications of the Micrometer. By M. J. L. ....Pounding Block for Arbors, Etc. By P. S. Bushnell....A Planer Tool for Sharp Corners. By Harry L. Cameron.	30-33
The Report of Engineer Melville.	34
The Numerous Factors in Practical Economy.	34
Questions and Answers.	35
Personal.	36
Obituary.	36
Sixth Annual Meeting of the Society of Naval Architects and Marine Engineers.	37
Technical Publications.	37
Foreign News Notes.	38
Commercial Review.	38

Abbozzo.

(A rough sketch or draft of anything.)

The American Machinist will be pleased to make an elegant engraving for you from any little abbozzo you may furnish.

American Machinist,
256 Broadway, New York.

Instruction by Mail in Mechanical Engineering.

THE correspondence method of instruction as employed by THE INTERNATIONAL CORRESPONDENCE SCHOOLS, Scranton, Pa., enables mechanics and others who are employed during the day to educate themselves by studying in their spare moments without loss of time from work.

THE COMPLETE MECHANICAL SCHOLARSHIP is a thorough course of instruction intended especially for machinists, machine shop laborers, inventors and designers, tool-makers, rolling mill workers, pattern-makers and draftsmen; shop foremen, superintendents and master mechanics; manufacturers, salesmen and inspectors of machinery and boilers; office men in establishments manufacturing machinery; gunsmiths, mechanics of all kinds and their sons, and mechanical apprentices. The papers are all written from a practical standpoint and the knowledge imparted is exactly what the student will require in every-day work. In this course are laid down and described the principles most frequently used in connection with mechanics, hydromechanics, pneumatics and thermodynamics, and these principles are all applied in the later papers in the course. The student will obtain a good knowledge of the principles governing the action and operation of steam engines and boilers, the strength of materials, valve diagrams, governors, the measurement of power, etc., and the course will give him a good insight into the subject of machine design. It is also well adapted to those persons who desire a more or less general knowledge of the subject of mechanical engineering; for example, patent lawyers, clerks working for manufacturing concerns, pattern-makers, molders and all other people who desire to have a general knowledge of machinery.

THE MECHANICAL DRAWING SCHOLARSHIP is intended for those persons who desire to obtain a knowledge of how to represent on paper the details of machines. Owing to our method of instruction the student who completes this course will be able to make a good working drawing of any object he may select, and the workmanship on the drawing, so far as mechanical execution, evenness of lines, accuracy of drawing, rigid adherence to the scale used, general appearance, etc., is concerned, will be equal to any work of like character done elsewhere. Our instructors in drawing exercise great care in correcting the student's work, pointing out every defect and doing all in their power to encourage him to improve in his work.

Few realize the importance of acquiring a knowledge of drawing It is the basis of all mechanical work; a knowledge of it is essential in many trades, and among every class of manufacturers there is a demand for men who can draw. Because of its great importance, drawing is given special attention in the courses of THE INTERNATIONAL CORRESPONDENCE SCHOOLS. It is included in nearly all our technical courses. Our method of teaching drawing is original and practical and is unsurpassed by any school in the world. We guarantee to teach any person who will follow our instructions. Many of our students have found that the knowledge of drawing which they obtained from their courses has been the means of their securing promotion and increased pay.

Terms of Payment: **In Advance or Installments of $5.00 or $2.00 a month.**

Also courses in Steam Engineering, Electrical Engineering, Civil Engineering, Architecture, Plumbing, Chemistry, Bookkeeping, Shorthand, English Branches. Full particulars free. Write to-day, stating subject in which you are interested.

The International Correspondence Schools,

Box 819, Scranton, Pa.

ENTIRE OUTFIT
LARGE ELECTRICAL WORKS

Containing the following MODERN STYLE MACHINE TOOLS, will be sold low right from where they are:

Powell Planer Co.'s heavy pattern Planer, 48 in. x 48 in. x 12 ft. with two heads, A1 order.
Powell Planer, 24 in. x 24 in. x 6 ft.
Fifield Engine Lathe, 50 in. swing, 14 ft. bed, with blocks to swing 72 in., chuck, etc., complete.
Putnam Engine Lathe, 40 in. swing, 16 ft. bed.
D. W. Pond Engine Lathe, 28 in. swing, 14 ft.
Flather Engine Lathe, 24 in. swing, 12 ft. bed, with 2 in. hollow spindle, chuck, etc.
Flather Engine Lathe, 18 in. swing, 8 ft. bed, with 1½ in. hollow spindle, chuck, etc.
Blaisdell Engine Lathe, 16 in. swing, 8 ft. bed.
Flather Engine Lathe, 14 in. swing, 6 ft. bed.
Bridgeport Boring and Turning Mill, 37 in.
Niles Radial Drill, 5 ft. arm, Semi-Universal.
Universal Radial Drill, 5 ft. swivel arm.
Nicholson Horizontal Boring Mill.
Universal Milling Machine, tool-room size.
Ames Lincoln Millers, latest pattern.
Windsor Screw Machine, 2 in. wire feed capacity, friction head, turret feed and tools.
Pratt & Whitney Screw Machines, Nos. 1 and 2, wire feed, with tools.
Stiles Power Press No. 2.
Prentiss Shapers, 12 in. crank and 20 in. stroke, friction geared.

J. J. McCABE,
14 Dey St., NEW YORK.

Send 50 Cents in stamps for a copy of

MACHINE SHOP ARITHMETIC.

American Machinist Publishing Co.,
256 BROADWAY, NEW YORK.

SPECIAL SALE BICYCLE MACHINERY.

We offer for sale the entire plant of the Yost Mfg. Co., Toledo. Machines are all in good condition, many of them equal to new. Letters may be addressed to us at Toledo until November 1. Tools will be sold cheap before removal.

4—Each No. 1, 2 and 3 Pratt & Whitney Screw Machines,
4—No 8 x Jones & Lamson Screw Machines.
9—No. 1 Cincinnati Plain Milling Machines.
24 in. x 24 in. x 6 ft. Gray Planer.
Warner & Swasey Die Sinker No. 1.
11—Baker Brothers Heavy Bicycle Drills.
6—Barnes Three-Spindle Drills.
20—Slate Sensitive Drills.
2—Hendey 15 in. Shapers.
5—14 in. Flather Lathes.
9—16 in. Flather Lathes.
P 3 and P 4 Ferracute Presses.
2—No. 74½ Bliss Presses, geared and plain.
2—800 lb. Bliss Drop Hammers.
1,000 lb. Bliss Drop Hammer.
And numerous other machinery.

Nickel Plant, Enameling Oven, Tools, Etc.
Send for complete list.

MARSHALL & HUSCHART MACHINERY CO.,
19 South Water St., CLEVELAND, O.
62-64 South Canal St., CHICAGO, ILL.

Address at Toledo until November 1.

SECOND-HAND MACHINERY.

ENGINE LATHES.

14 in. x 6 ft. Prentice.
18 in. x 12 ft. Bogart.
27 in. x 12 ft. Wood & Light.
48 in. x 18 ft. Gay & Silver.

SCREW MACHINES.

No. 2 Wire feed.
No. 2 P. & W., plain.
No. 2 1-2 P. & W., wire feed.
No. 4 Windsor, plain.
No. 4 Windsor, wire feed, auto.
No. 2 Niles, heavy.

PLANERS.

16 in. x 16 in. x 4 ft. Hendey.
24 in. x 24 in. x 4 ft. Wood & Light.
28 in. x 28 in. x 8 ft. Gay & Silver.
60 in. x 60 in. x 22 ft. Hepworth.

SHAPERS.

9 in. Traveling head, Sellers.
13 in. Traveling head, Bement.
14 in. Steptoe.
20 in. G. & E.

DRILLS.

6 spindle Quint.
Pond suspension.
22 in. G. & E., back geared.
32 in. G. & E., back geared.
32 in. Harris, back geared.
38 in. Wood & Light.

MISCELLANEOUS.

24 in. Lead Tapping Machine
No. 2 Water Tool Grinder. Springfield.
Centering Machine, Whiton.
Double-head Cam Miller, P. & W.
Special Cam Miller.
24 in. Gear Cutter, G. & E., half automatic.
36 in. Hand Gear Cutter, G. & E.
Lincoln Type Miller, P. & W.
48 in. x 12 ft. Hor. Boring and Drilling Machine.
16 in. x 8 ft. Pattern-makers' Lathe, milling machine attachment. Fay & Scott.
12 in. Thompson Splitting Shear.
Car mortiser and borer, B. & O.

We also offer a large stock of Shafting, Hangers and Pulleys, Benches and small tools at the shops of the United Machine Co., Irvington, N. J.

We have named above only our choicest tools.
Write us for anything you want.
Prices on application.

THE NILES TOOL WORKS CO.
136-138 Liberty Street, New York City.

BARGAINS IN
NEW AND SECOND-HAND MACHINERY.

Lathes, from 12" to 48"; Planers, from 20" up to 60. 48", 54" and 60" Radial Drills; No. 2 Newton Milling Machine; No. 2 Screw Machine; Shapers, from 6" to 30", Boilermakers' Punches, Shears, Edge Planers, Rolls, Drills, Engines, Boilers, Pumps, and Dynamos.

FRANK TOOMEY, 131 N. THIRD ST., PHILA.

U. BAIRD MACHINERY CO.,
523-525 Water St.; 524-526 First Av.,
PITTSBURGH, PA.

MACHINERY
—OF—
Duquesne Mfg. Co. Bicycle Factory
FOR SALE.

All Modern Tools, in EXCELLENT CONDITION.

WRITE FOR OUR LIST, JUST COMING OUT.

Does any Machine Factory

wish to acquire a patented invention of **Drop Hammer** with **Automatic Grip and Release,** suitable for all civilized countries?

Hugo Herman Meyer,
Riga, Russia.

(Machine Importers, founded 1873.)

---

14 IN. x 5 FT. Bradford LATHES.

25 of them. Almost New. Low Price.
The Lodge & Shipley M.T. Co. Cincinnati, O.

SECOND-HAND MACHINERY,
IN EXCELLENT CONDITION.

LATHES.

50 in. x 20 ft. Fifield.
48 in. x 20 ft. Sellers.
38 in. x 20 ft. Davis & Egan.
28 in. x 27 ft. Fifield.
27 in. x 10 ft. Davis & Egan.
24 in. x 20 ft. Fifield.
24 in. x 10 ft. Scott.
20 in. x 12 ft. Porter.
18 in. x 8 ft. Blaisdell.
16 in. x 6 ft. Reed.
15 in. x 6 ft. Porter.
14 in. x 6 ft. Davis & Egan.
12 in. x 5 ft. Silk.
10 in. x 4 ft. Frasse.

MISCELLANEOUS.

26 in. Davis & Egan Shaper.
17 in. x 17 in. x 4 ft. Putnam Planer.
30 in. x 30 in. x 6 ft. Putnam Planer.
30 in. x 30 in. x 8 ft. Star Planer.
36 in. x 36 in. x 12 ft. Davis & Egan Planer, with 2 heads.
Hand Miller, Garvin Universal Miller, Kempsmith Lincoln Miller, Pratt & Whitney.
12 in. x 5 ft. Turret Lathe.
18 in. x 6 ft. Turret Lathe.
40 in. B. G., P. F. Drill, Lodge & Davis.
15 in. x 6 ft. Universal Monitor Am. Tool Works. Co.
No. 4 Power Press, R. & K.

Also full line latest improved new machine tools.

J. B. DOAN & CO.,
68-70 South Canal Street, CHICAGO, ILL.

Second-Hand Machinery.

LATHES.

89 x 15 ft. 6 in Lincoln, triple geared.
84 x 20 Cleveland, triple geared.
62 x 22 Putnam, triple geared, fine.
51 x 20 Gay & Silver, triple geared.
38-50 x 15 Gage, P. G. & P. C. F.
32 x 23 New Haven, C. R. & P. C. F.
20 x 18 Ames, C. R., P. C. F. and 3 in. H. S.
23 x 8 Putnam, R. & F. rest.
21 x 12 Wright, R. & F. rest, 2 chucks.
20 x 8 Fifield, C. R. & P. C. F., fine.
19 x 12 Pond, C. R., P. C. F., 16 in. chuck.
18 x 20 Pratt & Whitney, P. G., swivel rest.
18 x 14 Pratt & Whitney, P. G., swivel rest, 14 in. chuck.
18 x 10 Flather, P. G., P. C. F. and 12 in. chuck.
18 x 6 Lodge & Davis, P. G. rest & P. C. F.
18 x 6 McMahon, C. R. & P. C. F.
18 x 21 Engine Lathe, P. G.
17 x 8 Putnam, R. & F. rest and P. C. F.
16 x 7 J. L. Bogart, R. & F. rest.
14 x 7 J. L. Bogart, R. & F. rest.
15 x 5 Star Tool Co., R. & F. rest and taper attch.
15 x 6 Prentice Brothers, R. & F. rest.
14 x 6 Putnam, R. & F. rest.
14 x 5 Porter R. & F. rest, 1½ in. H. S. and 6 in. ck.
13 x 5 Ames, R. & F. rest and chuck, fine.
10 x 5 Reed, R. & F. rest and chuck.
No. 1 Star, foot power.
Also a number of Pulley, Pattern Makers', Speed, Brass and Turret Lathes.

PLANERS.

66 in. x 60 in. x 16 ft. Planer.
48 in. x 48 in. x 12 ft. Putnam Machine Co.
42 in. x 43 in. x 16 ft. Bement.
36 in. x 36 in. x 12 ft. Wood & Light.
36 in. x 36 in. x 12 ft. N. Y. Steam Engine Co.
36 in. x 36 in. x 12 ft. New Haven.
32 in. x 32 in. x 8 ft. Pond, parallel drive; fine.
27 in. x 27 in. x 6 ft. Wood & Light.
26 in. x 26 in. x 6 ft. N. Y. Steam Engine Co.
25 in. x 25 in. x 7 ft. Harrington.
24 in. x 24 in. x 8 ft. Pratt & Whitney.
24 in. x 24 in. x 7 ft. New Haven.
24 in. x 20 in. x 5 ft. New Haven.
24 in. x 24 in. x 4 ft. Davis.
18 in. x 18 in. x 4 ft. Gould & Eberhardt.
2 16 in. x 16 in. x 12 in. Whitcomb, crank.
16 in. x 12 in. x 3 ft. Bench.

MILLING MACHINES.

No. 3 Cincinnati Universal.
No. 1 Brown & Sharpe Universal, no arm.
No. 2 Brown & Sharpe plain, back gears.
No. 0 Van Norman, with vise and index centers, practically new.
3 Pratt & Whitney, Lincoln pattern with tail-stocks, fine.
Providence Machine Co., Lincoln pattern.
2 No. 3 Garvin hand, no arm.
No. 2 Smith & Garvin hand, no arm.
No. 1½ Pratt & Whitney hand, no arm.
No. 1 Pratt & Whitney hand, no arm.
Newton plain, with overhanging arm.
25 in. x 16 in. x 6 ft. Worcester Machine Co., slab.

SCREW MACHINES.

No. 2½ Pratt & Whitney, fric. hd drawing chuck.
No. 2 Pratt & Whitney, plain.
No. 2 Brown & Sharpe, plain.
No. 1 Pratt & Whitney, wire feed.
No. 0 Prentiss, ¾ in. wire feed.

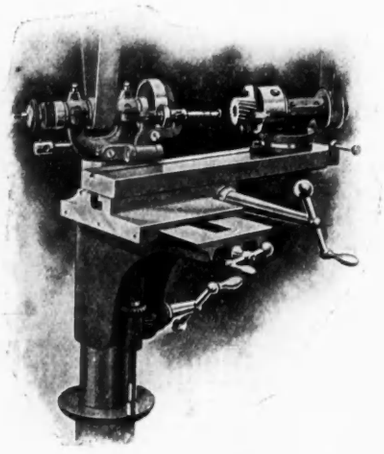
SHAPERS.

24 in. Walcott shifting belt.
24 in. Hendey friction.
16 in. Gould, crank.
2 15 in. Hendey friction, latest pattern.
14 in. Betts, traveling head, crank.
12 in. Warren, traveling head, crank.
8 in. Gould traveling head, crank.

Also a large stock of other tools on hand. Send for complete list.

PRENTISS TOOL & SUPPLY CO.,
603 D. S. Morgan Bldg., Buffalo, N. Y.
115 Liberty Street, New York City.

Internal Grinding. We get plenty of Speed.



Send for descriptive Catalogue.

NEW MACHINE. NEW PRICE.

UNIVERSAL GRINDER.

WELLS BROS. & CO., Greenfield, Mass.

Hand Milling Machines.

BUILT IN 3 SIZES.

Send for new Catalog of all our Machine Tools.

No. 2 Hand Milling Machine.

Large Stock of New and Second-Hand Machine Tools.

THE GARVIN MACHINE CO.,

Spring and Varick Sts., NEW YORK.

Philadelphia Store: The Garvin Machine Co., 51 North 7th St., Philadelphia, Pa.
Berlin Store: The Garvin Machine Co., m. b. H., 17 Burgstrasse, Berlin, C., Germany.
Agents in Great Britain: C. W. Burton, Griffiths & Co., Ludgate Square, Ludgate Hill, London, England.

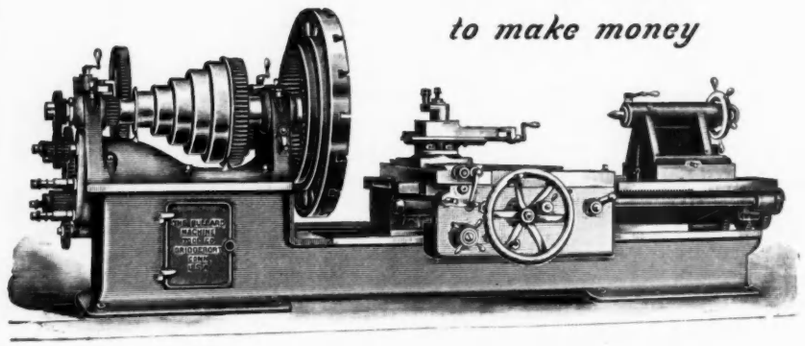
For TAPS, DRILLS, REAMERS, Etc., Etc.,

Use "HOBSON'S" (FH) CHOICE

(XX) Extra Cast Steel.

MADE ONLY BY
HOBSON, SEAMAN & COMPANY,
SUCCESSORS TO
FRANCIS HOBSON & SON, SHEFFIELD.
American Warehouse, 98 John St., New York.
CHAS. HUGILL, Agent.
Correspondence solicited.

The only way to make money



in the shop is to keep your machines busy. You may not have enough work to keep a large lathe busy; why not have a lathe that will handle smaller work as well as the larger and keep it busy?

Say a lathe like the Bullard Extension Lathe shown above; this is really two lathes in one—a 32 in. swing ordinarily and 54 in. when gap is opened. Full details on request.

Bullard Machine Tool Co., Bridgeport, Conn., U. S. A.

Chas. Churchill & Co., London. Schuchardt & Schutte, Berlin, Vienna and Brussels.
Ad. Janssens, Paris.

Move the machine to the work.

Dallett tools are specially devised for this purpose. They are: Portable Power and Electric Drills, Boiler Shell Drills, Hand Drills, Portable Electric Planers, Etc. There is quite a book illustrating and describing these tools, which will be sent on request.

Thos. H. Dallett & Co.,

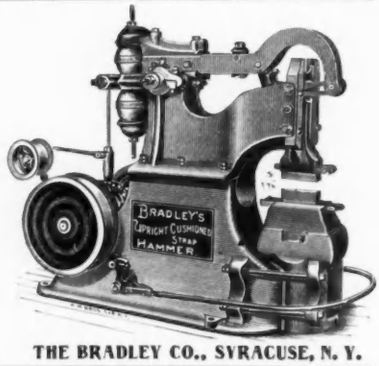
York Street and Sedgley Avenue, Philadelphia, Pa.

BRADLEY HAMMERS

Have never been equaled for quantity and quality of output, simplicity, durability and freedom from repairs.

Send for Circulars.

Foreign Agents:
Buck & Hickman, Whitechapel Road, London.
Schuchardt & Schutte, Berlin, Vienna, Brussels.



THE BRADLEY CO., SYRACUSE, N. Y.

Air Hardening Steel.

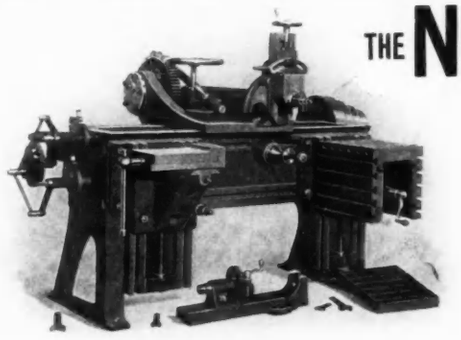
Guaranteed equal to the best.

MANUFACTURED BY
THE BENJAMIN ATHA & ILLINGWORTH CO.
DENMAN & DAVIS, . . NEW YORK AGENTS,
85 and 87 John Street.

2500 Greenerd Arbor Presses in use.

Saves time, arbor and money

MANUFACTURED BY
EDWIN E. BARTLETT,
364 Atlantic Ave., BOSTON, MASS.



18-INCH TRAVELING-HEAD SHAPER, No. 33.

THE NILES TOOL WORKS CO.

HAMILTON, OHIO, U. S. A.

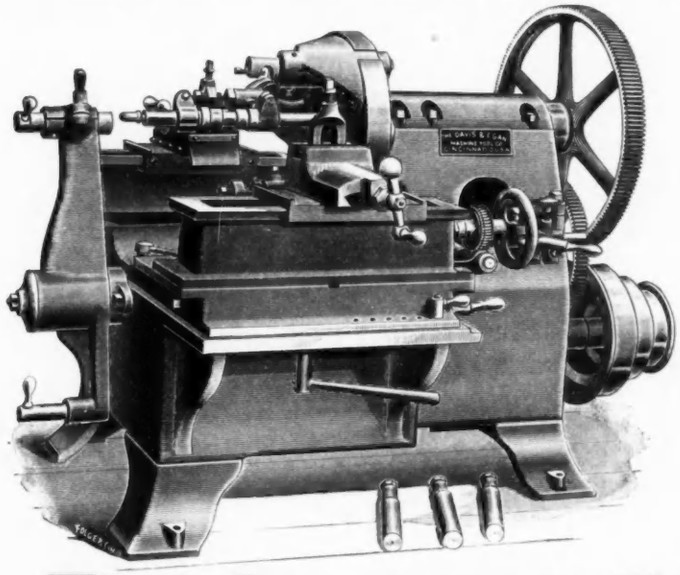
CABLE ADDRESS: "NILES, HAMILTON, OHIO."

MACHINE TOOLS.

BRANCHES:
NEW YORK, CHICAGO, BOSTON, PHILADELPHIA, PITTSBURG, ST. LOUIS, LONDON.

AGENCIES:
G. DIECHMANN & SON, BERLIN; H. GLAENZER & CO., PARIS; V. LÖWENER, COPENHAGEN "ATALANTA" TECHNICAL AGENCY, ST. PETERSBURG; SHERRIFF, SWINGLEY & CO., JOHANNESBURG.

TURN YOUR PULLEYS ON A LATHE BUILT SPECIALLY FOR THE WORK.



This machine turns Pulleys from 6 inches up to 30 inches.

FIFTY 6 in. PULLEYS 4 in. FACE or
TWELVE 30 in. PULLEYS 6 in. FACE
IN TEN HOURS.
A BOY CAN OPERATE IT.

WE ALSO MANUFACTURE

Engine Lathes, Planers, Shapers, Boring Mills, Milling Machines, Upright and Radial Drills, Screw Machines, Brass Workers' Lathes, Bolt Cutters, Punches and Shears, Etc., Etc.

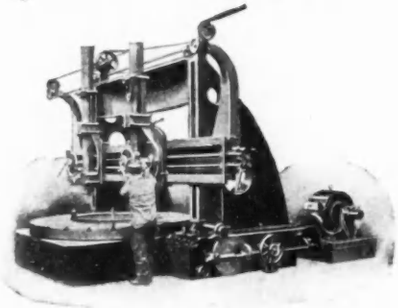
The American Tool Works Co.

Works: CINCINNATI, OHIO, U. S. A.

New York, 107 Liberty St. Chicago, 68 S. Canal St. Boston, 36 Federal St. Philadelphia, 19 N. Seventh St.
London, 7 Leonard St., Finsbury, E. C. Berlin, 49 Kaiser Wilhelm Strasse. Paris, 2 Place de la Republique. Vienna, 9 Eschenbach-Gasse.
Antwerp, 33 Rue des Peignes. Amsterdam, 22 Prinz Hendrikkade. Copenhagen, Vestre Boulevard.
Stockholm, Vasagatan 22 A. St. Petersburg, Bolshaja Morskaja.

Electricity for Machine Driving.

Perfect Power System.



Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

Offices in All Principal Cities.
Westinghouse Electric Co., Ltd.,
32 Victoria St., London.

Westinghouse Motor Operating Rotary Planer.

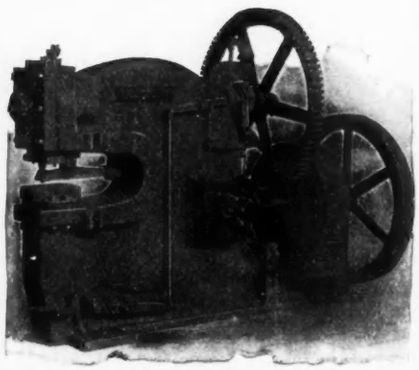
A good, safe

dividend paying investment is engravings of your machines or tools, made by the American Machinist in the American Machinist way. "The American Machinist kind" of engravings are a long remove from the kind that associate with the waste basket. They are the kind that command the busy man's attention. The American Machinist would be pleased to make the engravings for your new catalogue.

American Machinist,

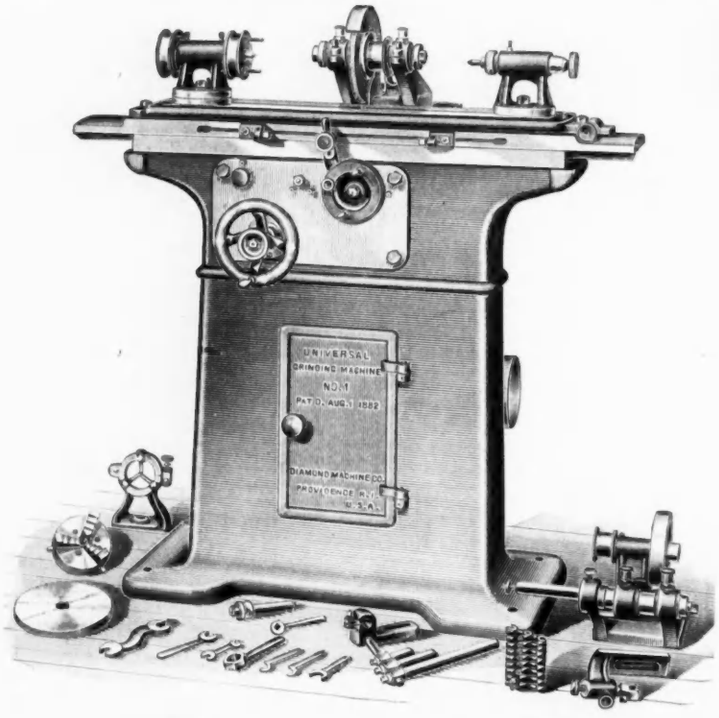
256 Broadway, New York.

The Bullock Electric Mfg. Co.



BULLOCK MOTOR DRIVING PUNCH.

CINCINNATI, O.



Universal Grinders.

NEW DESIGNS.
BEST WORKMANSHIP.

Strictly high-grade tools, with all attachments, pump for copious water supply, etc.

Made in 5 sizes, as below:

No.	Will Grind.
1	18 in. long, 8 in. diameter.
2	24 " " 10 " "
3 "A".....	30 " " 12 " "
2 "B".....	40 " " 12 " "
3 "C".....	60 " " 12 " "

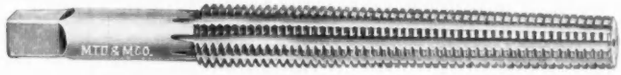
Diamond Machine Co.,

PROVIDENCE, R. I., AND CHICAGO, ILL., U. S. A.

London: Chas. Churchill & Co. Paris: Fenwick Freres Berlin: Garvin Machine Co. Copenhagen: V. Lowener.

MORSE
TWIST DRILL
AND MACHINE CO.,

No. 142.
HOB OR MASTER TAPS.



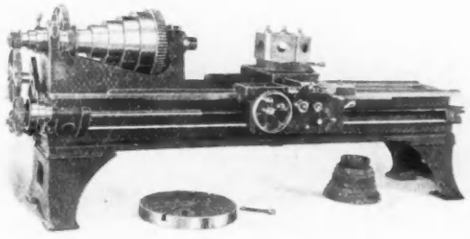
NEW BEDFORD,
MASS., U. S. A.

"You can make no rings if you throw a stone into a marsh."—GOETHE.

We also make Hob Taps for the various bolt cutters in the market, but need a drawing with order to show exact diameter and length of thread required.

In ordering Hobs always state whether they are required for hobbing chasers in Bolt Cutters, Solid Dies or Screw Plate Dies.

The "Springfield" 24 in. Turret Lathe.



Hexagon shaped turret on carriage, with six holes for tools. Power cross feed as well as power feed in line with the bed. Change gears furnished, so that all threads, from one to sixteen threads to the inch, inclusive, may be cut. We guarantee accurate lead screws and alignment of all parts of the machine. It is a very heavy, solid, blocky machine. The turret slide is of massive proportions. The holes in turret can be made as large as 2½ in. A bar can be passed through the turret. Built with any length of bed.

The Springfield Machine Tool Co.,

Springfield, Ohio, U. S. A.

Builders of Engine and Turret Lathes, Shapers and Power Presses.

ELECTRIC MOTORS

Manufacturers of the STANDARD ELECTRIGAL APPARATUS of the World

To Drive Your Machinery and Tools?

GENERAL ELECTRIC COMPANY,
SCHENECTADY, N. Y.

Sales offices in all large cities of the United States.

ENGINE and SPEED LATHES

IN VARIOUS LENGTHS—9 to 15 in. SWING.
Latest and Most Approved Designs. Workmanship, Material and Finish of the Highest Order.

SEBASTIAN LATHE COMPANY,
117 and 119 Culvert Street, CINCINNATI, OHIO, U. S. A.
Agents: SELIG, SONNENTHAL & Co., London, Eng.; JOHN TRAGARDH & Co., Goteborg, Sweden; E. SONNENTHAL, JR., Berlin, Germany; R. S. STOKVIS & ZONEN, Rotterdam, Holland.

Engravings

made by the American Machinist possess the peculiar property of showing the article illustrated in a very pleasing manner, and a careful regard for important details makes these cuts worth having. You can get cuts cheaper, but none better. This is for people who want good engraving, not the "how cheap" kind.

American Machinist,
256 Broadway, New York City.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.
L. B. BRAINERD, Assistant Treasurer.
L. F. MIDDLEBROOK, Assistant Secretary.

Mark Your Tools with a Steel Stamp.

SEND FOR PRICE LIST No. 4.

FOR EVERY-DAY USE.

No. 163. Sure Grip Wrench.

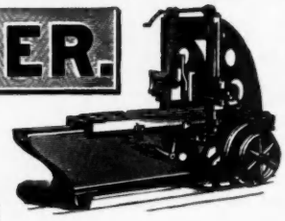
This little tool is made of good steel, nicely finished. It will hold any tool that can be put into it—taps, reamers, drills, etc. It will hold them whether round, square or oval. We made this for use in our shop and have decided it is one of our handiest tools.

LENGTH, 3 1-2 in.; CAPACITY, 1-4 in.
PRICE, 50c. For sale by leading dealers.

Write for our complete catalogue of Calipers, Dividers, Surface Gauges and Fine Tools.

J. STEVENS ARMS & TOOL CO.,
P. O. Box 2655,
CHICOPEE FALLS, MASS., U.S.A.

THE GRAY PLANER.



The G. A. Gray Co.,

Cincinnati, Ohio,

Manufacture Planers as an exclusive specialty.

Planers only! Nothing but Planers!!

William Sellers & Co. Incorp. PHILADELPHIA.

NOTE.—An important feature of our **MODERN LABOR-SAVING MACHINE TOOLS** is the convenient grouping of all of the operating levers and handles, thereby permitting the attendant to make necessary changes with rapidity and ease. This is one of the little details of construction which conduce not a little to the large capacity for work of our machine tools, as well as to the comfort of the operatives.

PULLEYS and SHAFTING. Boring Mills, Bending Rolls, Bolt Cutters, Cranes, Lathes, Planers, Slotters, Punches and Shears, Mechanical Stokers, Turn-Tables, Testing Machines, Etc. **INJECTORS for ALL SERVICE.**

Every Engineer

knows that the maximum productive capacity of an engineering establishment or of a manufacturing plant working metals can be realized only through the use of the most durable and efficient cutting tools, but all of them do not appreciate the service which "Constant Angle" Twist Drills will render in accomplishing this result. Send for catalogue to

The T. & B. Tool Co., Danbury, Conn.

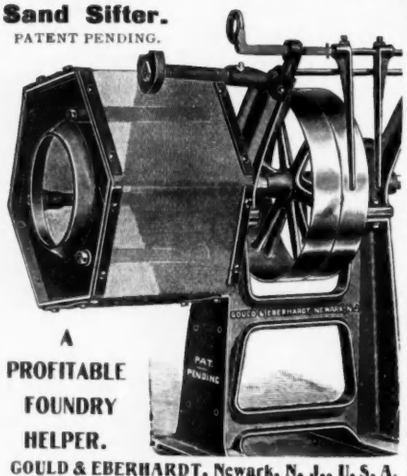
FRICTION CLUTCHES FOR ALL PURPOSES.

THE OSTERLEIN MACHINE CO., 307 W. Second St., CINCINNATI, OHIO.

EXPORT TRADE A SPECIALTY. ST. LOUIS, MO.

Sand Sifter.

PATENT PENDING.



A PROFITABLE FOUNDRY HELPER.

GOULD & EBERHARDT, Newark, N. J., U. S. A.

Schuchardt & Schutte, general agents, Berlin, Vienna and Brussels; Selig, Sonnenthal & Co., London, England; John Lang & Sons, Johnstone, Scotland; White, Child & Beney, Shaper agents, Vienna, Austria; G. Koeppen & Co., Shaper agents, Moscow, Russia.

GRANT GEARS

GEAR WHEELS AND GEAR CUTTING of every description.

GRANT GEAR WORKS,

626 Race St., PHILADELPHIA.
6 Portland St., BOSTON.
86 Seneca St., CLEVELAND.

Send for Catalog.

MILLING MACHINES,

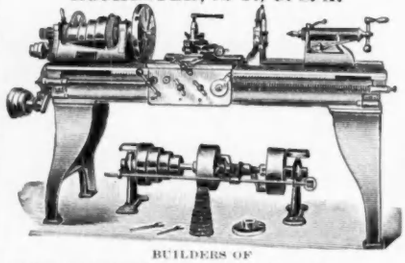
Plain and Special.

LUCAS & GLIEM Machine Works,

RIDGE AVENUE AND HAMILTON STREET, PHILADELPHIA.

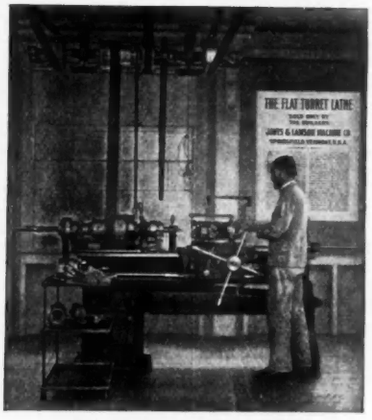
THE W. P. DAVIS MACHINE CO.

ROCHESTER, N. Y., U. S. A.



BUILDERS OF

FINE LATHES. From 10 to 30 inch swing. *Send for Catalogue.*

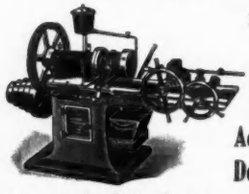


THE FLAT TURRET LATHE

Does Lathe work accurately up to 2 in. diameter by 24 in. long. JONES & LAMSON MACHINE CO., Springfield, Vermont, U. S. A. English Offices: Room 6, Exchange Building, Stephenson's Place, Birmingham. G. H. Pond, Manager; and 26 Pall Mall Manchester, in charge of Henry Kelley & Co. Germany, Belgium, Holland, Switzerland and Austria-Hungary M. Koyemann, Charlottenstrasse, 113, Dusseldorf, Germany.

The Acme Machinery Co.

CLEVELAND, O.,



Manufacturers of

Acme Bolt and Rivet Headers.

Acme Single, Double and Triple Automatic Bolt Cutters. *Cutting from 1-8 in. to 6 in. diameter.*

Also Separate Heads and Dies.

GLEASON LATHES

POWERFUL GEARING QUICK CHANGES

RACE St. ROCHESTER, N. Y.

THRUST COLLAR BEARINGS.

Anti-End Friction

(PATENTED.) Our T-C.

SEE NEXT WEEK.

The Ball Bearing Co.,

BOSTON, MASS.

Bicycle Tools, including Rim Drill, automatic and hand; Wood Rim Nipple Washers; Automatic and Hand Presses, for inserting washers; Tube Cutters, four sizes made; Hub Drill, double automatic; Wheel Assembling Stands, frame stands; 1, 2, 3, 4 and 5 Spindle Sensitive Drills; Shaper, Milling Machines and Punch Presses.

FOX

FOX MACHINE CO.,
125 North Front Street,
GRAND RAPIDS, MICH., U. S. A.

FLATHER & Co.,

High Grade Machine Tools.

NASHUA, N. H., U. S. A.